

BETHEL SALMON TEST FISHING PROJECT, 1990

By

Douglas B. Molyneux

Regional Information Report¹ No. 3A91-21

Alaska Department of Fish and Game
Division of Commercial Fisheries, AYK Region
333 Raspberry Road
Anchorage, AK 99518

September 1991

¹ The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

AUTHOR

Douglas B. Molyneaux is the Kuskokwim research biologist for the Alaska Department of Fish and Game, Division of Commercial Fisheries, P.O. Box 90, Bethel, AK 99559 (May through August) or 333 Raspberry Road, Anchorage, AK 99518 (September through April).

ACKNOWLEDGEMENTS

The success of the 1990 Bethel test fish program is attributed to the commendable diligence of project members Mike Wade and Chileen Perry. Additional field support was provided by Tim Heakin, Karen Hyer and other members of the Bethel ADF&G staff. Office support in compiling the results for publication was provided by Karen Samuelson. Their assistance is greatly appreciated.

Thanks is also extended to Larry Buklis and Kim Francisco for their continued support, patience and constructive comments.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	iv
LIST OF FIGURES	v
LIST OF APPENDICES	vii
ABSTRACT	1
INTRODUCTION	2
Fishery Description	2
Commercial Fishery	2
Subsistence Fishery	3
Project Background	4
METHODS	5
1990 Test Fishing	5
Migratory Timing	6
Standardized Catches	7
Catchability and Adjusted CPUE	8
RESULTS AND DISCUSSION	9
Chinook Salmon	9
Temporal Distribution	9
Unadjusted Passage Index	9
Catchability and Adjusted Passage Index	10
Species Composition	10
Gear Selection	11
Spatial Distribution	11
Sockeye Salmon	11
Temporal Distribution	11
Unadjusted Passage Index	11
Catchability and Adjusted Passage Index	12
Species Composition	12
Spatial Distribution	13
Chum Salmon	13
Temporal Distribution	13
Unadjusted Passage Index	13
Catchability and Adjusted Passage Index	14
Species Composition	14
Spatial Distribution	14
Coho Salmon	14
Temporal Distribution	14
Unadjusted Passage Index	15
Catchability and Adjusted Passage Index	15

TABLE OF CONTENTS (continued)

Species Composition	16
Spatial Distribution	16
Hydrological Data	16
LITERATURE CITED	17
APPENDICES	

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Drift schedule, by mesh size (cm) and station, used in the 1990 Bethel test fishery	18
2. Test fishing catch and unadjusted mean tidal CPUE by species for the 1990 Bethel test fishery	19
3. Cumulative drift CPUE by year and gill net mesh size for chinook salmon caught in the Bethel test fishery through 10 July of each year	24
4. Cumulative drift CPUE by station and species for the Bethel test fishery, 1984-1990	25
5. Daily catch composition of the 1990 Bethel test fishery and District 1 commercial fishery	27

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Kuskokwim Area commercial fishing districts	28
2. Kuskokwim Area district 1 statistical areas in 1988-89 and 1990	29
3. Approximate location of drift stations used in the 1990 Bethel test fish program	30
4. Cumulative proportions of unadjusted mean tidal CPUE for salmon caught in the 1990 Bethel test fishery	31
5. Comparison of the unadjusted 1990 mean tidal CPUE for chinook salmon caught in the Bethel test fishery and the District 1 chinook salmon commercial harvest, by period, and separated by catches made down stream and upstream of the Bethel test fishery	32
6. Cumulative unadjusted and adjusted mean tidal CPUE of chinook salmon from the 1984-1990 Bethel test fishery	33
7. Proportion of chinook salmon in the daily catches of the 1990 Bethel test fishery and District 1 commercial fishery	34
8. Comparison of the unadjusted 1990 mean tidal CPUE for sockeye salmon caught in the Bethel test fishery and the District 1 sockeye salmon commercial harvest, by period, and separated by catches made down stream and upstream of the Bethel test fishery	35
9. Cumulative unadjusted and adjusted mean tidal CPUE of sockeye salmon from the 1984-1990 Bethel test fishery	36
10. Proportion of sockeye salmon in the daily catches of the 1990 Bethel test fishery and District 1 commercial fishery	37
11. Comparison of the unadjusted 1990 mean tidal CPUE for chum salmon caught in the Bethel test fishery and the District 1 chum salmon commercial harvest, by period, and separated by catches made down stream and upstream of the Bethel test fishery	38
12. Cumulative unadjusted and adjusted mean tidal CPUE of chum salmon from the 1984-1990 Bethel test fishery	39

LIST OF FIGURES (continued)

<u>Figure</u>	<u>Page</u>
13. Proportion of chum salmon in the daily catches of the 1990 Bethel test fishery and the District 1 commercial fishery	40
14. Comparison of the unadjusted 1990 mean tidal CPUE for coho salmon caught in the Bethel test fishery and the District 1 coho salmon commercial harvest, by period, and separated by catches made down stream and upstream of the Bethel test fishery	41
15. Cumulative unadjusted and adjusted mean tidal CPUE of coho salmon from the 1984-1990 Bethel test fishery	42
16. Proportion of coho salmon in the daily catches from the 1989 Bethel test fishery and District 1 commercial fishery	43
17. Profile of a cross-section from the Kuskokwim River approximately four miles upstream of Bethel as it appeared in 1990, and the area sampled by gill nets used in the Bethel test fishery	44

LIST OF APPENDICES

<u>Appendix</u>	<u>Page</u>
A. Memorandum concerning the elimination of the fourth gill net drift in the Bethel test fishery	45
B. Catch and drift CPUE for the 1990 Bethel test fishery	49
C. Historic mean date of salmon migration at the Bethel test fish site, 1984-1990	60
D. Historic test fish catch data and adjustment calculations for salmon caught in the Bethel test fishery	61
E. Log of catchability adjustment analysis for each commercial fishing period in 1990	62
F. Historic commercial salmon catch from statistical areas in the lower Kuskokwim River, 1984 - 1990	63
G. The 1990 commercial salmon catch, in numbers of fish, for District 1 statistical areas	64
H. Daily water temperature and clarity of the Kuskokwim River at the Bethel test fishing site 1984 - 1990	65

ABSTRACT

Annual timing and abundance of adult chinook, sockeye, chum and coho salmon returning to the Kuskokwim River has been indexed by the Bethel drift gill net test fishery since 1985. This test fishery replaced the Kwegooyuk set gill net test fishery located near the mouth of the Kuskokwim River. The Bethel test fishery has generally been more successful as an index of fish abundance at the test fish site and has replaced the Kwegooyuk test fishery.

Methodology used in the Bethel test fishery consists of a series of timed drifts using 13.6 cm (5-3/8 in) and 20.3 cm (8 in) gill nets at three stations across the river channel. Each series was begun at approximately one hour following each high tide throughout the fishing season. Catches were standardized to produce a mean tidal CPUE, plus attempts were made to enhance the comparison of mean tidal CPUE between years by calculating a catchability adjustment factor for each year by species.

In 1990 the Bethel test fishery was operated from 1 June through 31 August. The mean date of migration for chinook, sockeye, chum and coho salmon as indexed by the test fishery was 26 June, 28 June, 7 July and 13 August, respectively. These dates were 2 to 4 days later than historic averages.

The cumulative unadjusted mean tidal CPUE's for each species were 444.8, 1,114.4, 2,721.9, and 2,485.1. The cumulative CPUE for chinook salmon was above the 1984 through 1989 average while the CPUE's for sockeye and chum salmon were below average and near average for coho salmon.

Cumulative unadjusted data and adjusted data did not always agree. However, post comparisons of the information against commercial catch data suggests that the unadjusted CPUE was the better indicator for chinook while the adjusted CPUE better represented the chum and coho abundance. Neither index compared well with sockeye commercial catch results.

KEY WORDS: Kuskokwim, salmon, *Oncorhynchus*, abundance, test fishery, timing and passage.

INTRODUCTION

The primary objective of salmon management is to provide an optimum sustained harvest by regulating annual harvest in such a way as to ensure adequate spawning escapement. Successful management requires accurate and timely knowledge about migratory timing, run strength and escapement levels. For Kuskokwim River salmon stocks these information needs are met in part by the Bethel test fishery which serves as an index of run timing and abundance.

Fishery Description

Stocks of chinook (*Oncorhynchus tshawytscha*), sockeye (*O. nerka*), chum (*O. keta*) and coho (*O. kisutch*) salmon are the targets of intense periodic fishing pressure in the Kuskokwim River by commercial and subsistence fishermen. The commercial fishery is directed primarily at chum and coho salmon while chinook salmon are the main target of subsistence users. Because of conservation concerns chinook salmon have not been subjected to a directed commercial fishery since 1987; however, substantial numbers of this species are caught incidentally during commercial openings just as chum and coho are caught to a lesser degree by subsistence fishermen. Sockeye salmon have a naturally low abundance in the Kuskokwim drainage so catches of this species are also incidental. Harvests of pink salmon (*O. gorbuscha*) are negligible and not considered in this report.

Commercial Fishery

Commercial harvest in the Kuskokwim River occurs in two separate districts. District 1, the lower Kuskokwim, extends from the mouth of the river to one mile above the Tuluksak River confluence 220 km (137 mi) upstream (Figure 1). District 1 is divided into four statistical areas (335-11, 335-12, 335-13 and 335-14) which apportion the district into segments of approximately equal length (Figure 2).¹ These statistical areas allow for better analysis of harvest patterns. District 2, the middle Kuskokwim, is 113 km (60 mi) in length and extends from High Bluffs to Chuathbaluk. District 2 consists of only one statistical area (335-20). Districts 1 and 2 are separated by a section of river approximately 80 km (50 mi) in length; this section is closed to commercial fishing. All waters upstream of District 2 are also closed to commercial fishing.

Gill nets are the gear type used in the commercial fishery. Drift gill nets are the most common method employed but set gill nets are also legal. The mesh size used in the commercial fishery is restricted to 15.2 cm (6 in) or smaller. This mesh restriction has been imposed since 1985 in an attempt to improve declining chinook salmon escapements. Results of this and other conservation measures have

¹ Prior to 1990 District 1 was only divided into three statistical areas (335-11, 335-12 and 335-13). In 1990 the statistical area farthest downstream (335-11) was divided in half. The numbering of all four statistical areas was then reordered to 335-11 and 335-12 (formerly 335-11), 335-13 (formerly 335-12) and 335-14 (formerly 335-13).

been encouraging as evidenced by the recent trend in increasing chinook salmon abundance (Francisco, et al. 1990).

Although commercial fishermen are not restricted from fishing in any Kuskokwim Area commercial fishing district, most effort is concentrated in District 1, especially statistical area 335-12 which is immediately downstream of the Bethel test fish site. Catch data from the two upriver statistical areas (335-13 and 335-14) are generally thought to underestimate the actual catch from these locations because fish caught in these areas are often delivered in Bethel (statistical area 335-12) and consequently the wrong statistical area is recorded on the fish tickets (Francisco personal communication).

District 1 has supported as many as 679 units of gear during a single 8-hour commercial fishing period (Francisco, et al. 1990). This amount of active drift gear probably results in a saturated fishing district, a conclusion supported by observations that most of the harvest occurs within the first three to four hours of each six to eight hour opening (Francisco personal communication, Huttunen 1988). Commercial fishing periods typically result in depressed test fish catches for 1 to 2 days following each opening.

Subsistence Fishery

Alaska state law mandates that subsistence needs have priority over commercial use of the fisheries resources. In the Kuskokwim Area subsistence is a prominent and vital element to the local life style. Along the Kuskokwim River the subsistence salmon fishery is especially important; this is evidenced by the fact that the number of chinook salmon taken from the river for subsistence purposes is often greater than the number taken commercially (Francisco, et al. 1990). This was often true even in years when subsistence harvest competed with a directed commercial fishery for chinook salmon.

The types of gear used by subsistence fishermen are generally similar to the gear used for commercial fishing. However, set gill nets are more prevalent in the subsistence fishery and there is no restriction on mesh size. In June most subsistence fishermen use 20 to 22 cm (8.0 to 8.5 in) mesh is the gear size gill nets to target on chinook salmon.

Subsistence fishing occurs throughout the Kuskokwim River including many of the major spawning tributaries, but over half of all subsistence fishing occurs in that portion of District 1 located downstream of the Bethel test fishery (Francisco, et al. 1990). By regulation, subsistence fishing in District 1, and between Districts 1 and 2, is closed 16 hours before, during, and 6 hours after each District 1 commercial fishing period². In District 2 the subsistence fishery is closed 24 hours before, during, and 6 hours after each District 2 commercial period. Subsistence fishing above District 2 is generally open 7 days a week with no closures.

² Kuskokuak Slough is an exception to the subsistence fishing regulations in District 1. Subsistence fishing in the slough may begin as soon as the commercial fishing period is over (i.e., no 6 hour delay). The slough is also closed to commercial fishing.

Project Background

From 1966 through 1983 the Department conducted a set gill net test fishery in the lower reach of the Kuskokwim River near an abandoned fish camp called Kwegooyuk (Huttunen 1984). This portion of the river ranges from approximately 5 to 7 km in width and has a major channel along both the east and west shores. The channels are separated by soft sandy shoals which are mostly flooded at high tide. Relief along the shore is minimal such that looking across the channel at high tide the horizon is formed by the meeting of water and sky much like occurs when looking out at open ocean. In this expansive body of water the Kwegooyuk test fish gill nets, 49 m in length, were set from the east shore just upstream of the lower boundary of District 1 and fished 24 hours a day.

The goals of the Kwegooyuk test fishery were to index run timing and abundance of chinook, sockeye and chum salmon. Although the project did adequately index run timing, it was not able to satisfactorily index run abundance. This problem was attributed to fluctuations in the preferred migratory route of salmon as influenced in-season by changes in weather patterns, and between seasons by alterations in the cross-sectional profile of the channel (Huttunen 1984). Indeed, changes in the channel profile are so profound that every few years commercial barge traffic switch from the west to east channel, or vice versa, as one channel becomes shallower and the other deeper (Brown³ and Korteus⁴ personnel communication). As a further impediment, the remoteness of the location made proper sale or distribution of daily test fish catches difficult or impossible. This later problem often resulted in unavoidable wastage which was not acceptable to ADF&G, local residents, or the industry (Francisco, personal communication).

Efforts to redesign the test fish program began in July of 1983, focusing on the use of drift gill nets in a more pragmatic section of channel near Bethel (Huttunen 1984). The objectives of the resulting trial drift gill net test fishery were to collect run timing and abundance information for coho salmon. Drifts were conducted in the main stem Kuskokwim River about 5 km (3.5 mi) upstream from Bethel, near the boundary line separating what is now designated statistical areas 335-12 and 335-13. The river was approximately 1 km wide at the new location and had a single major channel⁵ that allowed drift gill nets to collect accurate catch per unit effort (CPUE) data at selected stations across the entire channel width. The new location was also convenient to outlets for the sale and distribution of daily catches. The conclusion from the trial was that the drift gill net test fishery at Bethel was viable and offered a more reliable means of monitoring run timing and salmon abundance than the Kwegooyuk test fishery. The historic Kwegooyuk set gill net program was discontinued in

³ Charlie Brown is a resident of the village of Eek and was a crew member of the Eek test fishery in 1988-90 which was a project sponsored cooperatively between the local fishing industry and ADF&G.

⁴ Gerald Korteus, Sr. operates a local tender on the Kuskokwim River, has served as river pilot for directing barge traffic in the river and buoy tender for marking the navigable river channel.

⁵ Three small channels, Straight, Steamboat and Church Sloughs circumvent the site but are considered minor contributors to fish passage (Huttunen, personal communication).

1984 and replaced with a multiple mesh drift gill net project referred to as the Bethel test fishery⁶ (Huttunen 1985).

Relocation of the test fishery to a point upriver of most commercial and subsistence harvest caused a new problem. Instead of indexing total run abundance, as was the objective of the Kwegooyuk test fishery, the Bethel test fishery indexes abundance of salmon at the test fish site or, to put it another way, passage out of statistical area 335-12. This distinction is important because the commercial and subsistence harvests are not accounted for in the Bethel test fish index. Moreover, the salmon mortality rate induced by the commercial fishery is probably inconsistent because of changes in gear efficiency, changes in regulations designed to alter harvest efficiency, variability in fishing pattern (length of openings and frequency of openings), variability in the synchrony of openings with the entry pattern of salmon, the occurrence of fishermen's strikes, etc. These inconsistencies confound the ability of the project to accurately and consistently index total run abundance. Still, the Bethel test fishery provides a reasonable and cost effective index of timing and abundance beyond what the old Kwegooyuk project could provide. To improve upon the Bethel test fish project would most likely require either a costly multiple field camp strategy at the river's mouth or an approach using acoustical technology to provide actual fish counts. The later option is being pursued and is currently in a developmental stage.

METHODS

1990 Test Fishing

The methods and location used in the 1990 Bethel drift gill net test fishery were similar to those used since 1984. Following each high tide a series of drifts were conducted in a section of river near Bethel by a two-person crew using a 6.1 m (20 ft) skiff and 90 m (50 fathom) gill nets. Each series of drifts began one hour after the published high slack tide for Bethel to insure that all drifts were conducted in water flowing downstream. Drifts began approximately 5 km (3.5 mi) upstream of Bethel, where Straight Slough diverges from the main channel. This location was just upstream of the boundary separating statistical areas 335-12 and 335-13 (Figure 2). Each drift was conducted at one of three stations across the width of the main channel (Figure 3). Once deployed nets were fished approximately 25 minutes before retrieval was begun. The mean fishing time was calculated as half the time it took to both deploy and retrieve the net plus the time the net was fully deployed. On average each drift took about 30 minutes to complete. The distance covered by each drift varied depending on water and channel conditions but the distance was generally less than 3 km (2 mi). To avoid conflict with commercial fishermen no drifts were conducted during commercial fishing periods.

Drifts began on 1 June and continued through the morning tide on 31 August. From 1 June through 10 July two different mesh sizes were used in the test fishery.

⁶ Also referred to as the Kuskokwim test fishery.

The first two drifts of each tide were conducted with 20.3 cm (8 in) stretched mesh gill nets and the second two drifts were made with 13.6 cm (5-3/8 in) mesh. Different mesh sizes were used because the larger mesh selected for larger chinook salmon while the smaller mesh was more effective on smaller chinook and other species of salmon.

A repeating random schedule of six unique permutations was used to determine the mesh size fished at each station such that no station was fished with the same mesh size twice during a single tide (Table 1). This design resulted in one station being fished twice, first with 20.3 cm gear then with 13.6 cm gear, and each of the other two stations being fished only once with one of the two mesh sizes during each tidal series of drifts. Which station was missed by which mesh size varied with the random schedule described above. This discontinuity was the result of time and fiscal restraints but was consistent with past years.

After 10 July the chinook salmon migration in the lower Kuskokwim River was essentially over each year so use of the larger 20.3 cm mesh nets was discontinued. In past years all four drifts were continued with the smaller 13.6 cm mesh and using the random fishing schedule describe above to determine which of the three stations would be fished twice. This ensured that the one duplicated drift was distributed randomly between stations. Results of the duplicated drifts were then averaged. The duplicated fourth drift was shown to be unnecessary (Appendix A). The practice was discontinued in 1990 in favor of fishing each of the three stations once.

The 20.3 cm and 13.6 cm mesh gill nets were 50 fathoms in length and approximately 6.7 and 5.8 m deep, respectively. The webbing was manufactured by Nagura Net Company and hung at a 2:1 ratio. Specifications for the 20.3 cm mesh webbing were 225d# 24 twine, 35 meshes deep by 110 fathoms length, with a color code of NG80 (light green). Specifications of the 13.6 cm webbing were 1.5 X 7 twine with centercore, 45 meshes deep by 110 fathoms length, with a color code of NG15 (light green).

The catch for each drift was tallied by species and by station. At the end of each tidal series of drifts the catch was sold to a local processor or donated to individuals desiring the fish for personal use and data was recorded in the office log. Age, sex and size data were collected for use in the developmental Kuskokwim River sonar project but results will not be presented in this report.

Migratory Timing

The mean date of migration (t) as defined by Mundy (1982) was calculated for each species as:

$$t = \sum_{i=1}^n (t_i p_i)$$

where t_i is the coded date of migration and p_i is the daily proportion of test fishing CPUE indices observed on day i . The daily proportion of CPUE indices is calculated as:

$$p_i = I_i I^{-1}$$

The variance about the mean date of migration (s_t^2) was calculated as:

$$s_t^2 = \sum_{i=1}^n (t_i - t)^2 P_i$$

A larger variance means fish occurred in substantial numbers over a longer period of time.

Standardized Catches

The actual salmon catch for each drift was converted to CPUE to enhance the comparability of catch results. The drift CPUE index considers potential differences in the length of net used and the mean fishing time of each drift to express the catch as the estimated number of fish which would have been caught if 180 m (100 fathoms) of net had been fished for exactly 60 minutes. This is a standard used in many gill net test fisheries statewide (Meacham 1978; Waltemeyer 1983). Each drift CPUE index (I) was computed as:

$$I = 6,000 C (L T)^{-1}$$

where C is the catch of each species in numbers of fish, L is the length of net used in fathoms, and T is the mean fishing time in minutes.

The drift CPUE's for each tide were combined over all stations to calculate a mean tidal CPUE index (I_i) for each species. The formula is:

$$I_i = n^{-1} \left(\sum_{j=1}^n I_{i,j} \right)$$

where $I_{i,j}$ is the drift CPUE index from drift j on tide i , and n is the number of applicable drifts. For chinook salmon the mean was calculated using the drift CPUE from both 20.3 cm and 13.6 cm nets with each drift and mesh size weighing equally ($n = 4$). In contrast, only catches in the 13.6 cm mesh nets were used to calculate mean tidal CPUE's of sockeye, chum and coho salmon ($n = 2$ before 10 July and $n = 3$ after 10 July).

If a tide was not fished by the test fish crew an estimated mean tidal CPUE was calculated using one of two methods. First, if the tide was missed due to a commercial fishing period the mean tidal CPUE for the missed tide was assumed to be equal to the CPUE of the next tide fished. Second, if the missed tide was not affected by commercial openings then the estimate was assumed to be an average of the preceding and following mean tidal CPUE's.

Actual and estimated mean tidal CPUE's were summed by species throughout the season to generate total annual CPUE indices (I):

$$I = \sum_{i=1}^n I_i$$

where n is the total number of tides which occurred throughout the course of the project.

Catchability and Adjusted CPUE

As described earlier, the Bethel test fish index was used to compare the magnitude of salmon passage between years. Such a comparison assumes that the catchability of fish between years remains constant; i.e., the test fishery is consistently able to catch the same proportion of fish passing the site. But this assumption is undoubtedly violated both between and within years because of subtle changes in the techniques employed by the test fish crew, changes in the size or behavior of fish, and changes in channel morphology. As an attempt to compensate for this the cumulative mean tidal CPUE for each species was adjusted based on a ratio of specific downstream commercial catch statistics to observed declines in test fishing CPUE immediately following a commercial fishing period (Huttunen 1987). Unexploited relative abundance (I) within the statistical area during commercial fishing period j was estimated using peak-to-peak interpolation between the mean test fishing CPUE on the two (i^{th}) tides before an opening and that from the first two tides following the recovery of CPUE's to what was assumed to be unharvested levels. The formula was:

$$\hat{I}_j = K m^{-1} \left(\sum_{k=1}^m I_{jk} \right)$$

where k is the number of tides used to interpolate within, m is usually four (the two tides of unexploited CPUE before a commercial fishing period and the two tides of unexploited CPUE following a commercial fishing period), and K is the number of tides with depressed or 'exploited' CPUE. Catchability (C) at the test fishery during commercial fishing period j was then described as a function of the known harvest as:

$$C_j = 0.01 [H_j (\hat{I}_j - \sum_{r=1}^p I_r)^{-1}]$$

where H_j is the downstream harvest in statistical area 335-11 plus 335-12, p is the number of tides with depressed test fishing CPUE due to commercial harvest removal (usually three or four), and I_r is the actual CPUE observed during each tide of 'exploited' test fishing.

The catchability adjustment factor (C_j) was calculated for each commercial fishing period that conformed to the assumptions described by Brannian (1988). The mean C_j was then calculated for each species as a cumulative unweighted average as the season progressed and multiplied across all mean tidal CPUE's to yield 'adjusted' mean tidal CPUE's.

Historically a similar method was used to estimate the actual number of fish passing the test fish site. However, Brannian (1988) found that many of the basic assumptions were violated so the practice was discontinued. Many of those same assumptions and violations apply to the adjusted mean tidal CPUE as used in this report. However, the technique continues to be used, because of its ability to correct for net saturation in years of high fish abundance. Beyond this isolated application the potential advantage presented by the adjustment may not outweigh the disadvantages it introduces. Post season the validity of both indexes were checked by comparing their results, in historic contexts, to the historic commercial catch statistics in District 1.

RESULTS AND DISCUSSION

The 1990 test fishery began on 1 June, several days before any substantial numbers of returning salmon were observed near the Bethel site (Table 2, Figure 4). By the end of the season a total of 542 drifts were made and the total catch consisted of 283 chinook, 433 sockeye, 1,180 chum and 1,099 coho salmon (Appendix B). Chinook, sockeye and chum salmon migrations ended long before the test fishery was concluded, but small numbers of coho salmon did persist in the catches through the end of the program. Nevertheless, a pronounced decelerating entry pattern had been established for coho salmon before the project was terminated for the season, suggesting that the overwhelming majority of coho had passed through the test fishing site by the ending date (Table 2, Figure 4).

Chinook Salmon

Temporal Distribution

Chinook salmon were observed in the Bethel test fishery for a period of 86 days, 2 June to 26 August, but 80% of the test fish catch occurred between 11 June and 4 July (Table 2). The mean date of migration (t) and mean date variance (s_t^2) were 26 June and 148.7 (Appendix C). This mean date was 2 days later than the 1984-1989 average and the variance was 42 percent lower than the historic average. The low variance implies a more constricted temporal distribution of the chinook salmon run in 1990 than in most other years.

Abundance of chinook salmon in the 1990 test fish catches occurred as a series of approximately 8 pulses with each pulse lasting 5 to 10 tides (Figure 5). The pulses increased in magnitude peaking on 25 June then gradually decreased in magnitude. The pulse pattern could not be solely attributed to commercial harvest. Instead, the periods of abundance appeared to occur as natural events. Local fishermen were well aware of these temporal pulses and attribute them to changes in weather patterns, such as the development of storm fronts in Kuskokwim Bay, especially if the storms were accompanied by strong southerly winds. It was likely that the downriver subsistence harvest also influences the occurrence of these pulses at the test fish site, but the effect of subsistence fishing was unknown and assumed here to be minimal or uniform. Fishery managers and researchers need to be aware of these pulses because of their implications on interpreting test fish results.

Although the number of chinook caught on any given tide was relatively small (range of 0 to 18) intertidal variability was only moderate (Table 2, Figure 5). Still, because of the small sample sizes users of this information should be especially cautious in interpreting results.

Unadjusted Passage Index

Passage of chinook salmon out of statistical area 335-12 in 1990, as indexed by the cumulative unadjusted mean tidal CPUE, was 447.9 and was evidence of an improving chinook salmon run (Table 2). This was the third highest chinook

salmon index on record and 30 percent above the 1984-1989 average of 342.5 (Figure 6, Appendix D). The high return was attributed, at least in part, to changes in management strategy which began in 1987 to regulate gill net mesh size so that the gear selects against the harvest of chinook salmon. Indeed, the top four test fish indexes for chinook salmon have all occurred since 1987.

Three other lines of evidence also suggest that the chinook run was improving. First, despite gear selection against chinook harvest the 1990 District 1 commercial catch of this species was 51,883 fish, the second highest catch since 1974 and 70 percent above the 1984-89 average of 30,524 fish (Francisco et al. 1991, Francisco et al. 1990). Second, the 1990 escapement index at Kogrukluk weir of 10,219 chinook was the third highest observed since 1983, exceeded only in 1988 and 1989.⁷ Third, the 1990 Kuskokwim drainage chinook salmon aerial escapement index of 21,884 was the highest index achieved since 1981 and follows a building trend which began in 1987 (Francisco, et al. 1991).

Catchability and Adjusted Passage Index

The 1990 mean catchability adjustment factor for chinook salmon was 2.2773. Because of the disjunct entry pattern chinook salmon exhibited in the test fishery this number was derived from only one commercial fishing period (Appendix E). This was the lowest mean catchability factor yet recorded and well below the 1984-1989 mean of 4.5935 (Appendix D).

The resulting cumulative adjusted CPUE of 1,013.0 suggests the relative abundance of chinook in the test fish catch was well below 1987 and 1988 (no adjustment was calculated in 1989) and grouped closely with 1984, 1985 and 1986 (Figure 6). In contrast, the cumulative unadjusted CPUE suggests the relative abundance in 1990 was between 1987 and 1988 and well above the other years. A comparison of historic commercial catch immediately upstream of the test fish site, in what is now called statistical area 335-13, presents a pattern of abundance more closely aligned with the unadjusted data (Appendix F).⁸ Because of this and other considerations (the adjustment factor being derived from only one commercial fishing period and the lack of any problem with net saturation) the 1990 unadjusted data was a better indicator of passage at the test fish site than the adjusted data.

Species Composition

The proportion of chinook salmon in the test fishery, as indexed by the mean daily unadjusted CPUE, was variable but typically small (Figure 7). The proportion gradually increased then peaked on 25 June followed by a gradual

⁷ One potential problem is that males accounted for by 77.5 % of the weir escapement sample in 1990.

⁸ Direct comparison of commercial catch in what is now called statistical area 335-13 and test fish results is confounded to some degree by changes over the years in the boundaries of this statistical area.

decline. By 11 July the proportion of chinook salmon in the catch was negligible. In comparison, the proportion of chinook salmon in the commercial fishery peaked on 20 June, the first commercial fishing period, and was followed by an abrupt decline (Figure 7, Appendix G). The first commercial fishing period was restricted to down stream of Bethel.

Gear Selection

Chinook salmon were caught in both the 20.3 cm and 13.6 cm mesh gill nets (Table 3). The smaller gear accounted for 46.3% of the catch which was considerably lower than the 1984-89 average of 61.0%.

Spatial Distribution

The proportion of chinook salmon in stations I, II and III was 42.9%, 30.8% and 26.4%, respectively (Table 4). This was a more even distribution than the 1984-89 average of 55.0%, 17.1% and 27.9%, but was within the range of past observations.

Sockeye Salmon

Temporal Distribution

Sockeye salmon were observed in the Bethel test fishery for a period of 57 days, 11 June to 6 August, but 80% of the test fish catch occurred between 18 June and 8 July (Table 2). The mean date of migration (t) and mean date variance (s^2_t) were 28 June and 59.3 (Appendix C). The mean date was 2 days later than the 1984-1989 average and the variance was 69 percent lower than the historic average variance. This was the lowest variance recorded for sockeye in the test fishery and implies a more constricted temporal distribution of fish in 1990 than previous years.

Abundance of sockeye salmon in the 1990 test fish catches occurred as a series of approximately 4 poorly defined pulses with each pulse lasting 5 to 18 tides (Figure 8). The pulses were relatively uniform in height but the tide to tide variability was substantial. The pulse pattern and tidal variability could not be solely attributed to commercial harvest. The pulses appeared to occur as natural events as described for chinook salmon. The strong variability was likely a function of the relatively small tidal sample size which ranged from 0 to 23 (Table 2). Because of the small sample size and dramatic variability users of this data should be especially cautious in interpreting results.

Unadjusted Passage Index

Passage of sockeye salmon out of statistical area 335-12 in 1990, as indexed by the cumulative unadjusted mean tidal CPUE, was 1,123.9 (Table 2). This value was 31 percent below the 1984-1989 average of 1,623.3 (Figure 9, Appendix D). In contrast, the 81,950 sockeye salmon caught in the 1990 District 1 commercial catch was 4 percent above the 1984-89 average of 78,837 fish (Francisco, et al.

1991). Furthermore, the 35,308 sockeye salmon caught in statistical areas 335-13 and 335-14 in 1990 was 10 percent above the 1984-89 average of 32,222 fish (Appendix F). Comparable historic data on sockeye escapement in District 1 is incomplete.

The discrepancy between test fish results and commercial catch data highlight the weakness of the Bethel test fishery for indexing sockeye salmon. The discrepancy was attributed to two factors. First, was the small sample size of sockeye salmon in the test fishery as described early. Second, and perhaps more importantly, was the belief that the mesh types used in the Bethel test fishery select against sockeye salmon (Huttunen and Francisco, personnel communication). The design of the test fishery has not been revised to compensate for this discrepancy because of fiscal restraints and the relatively small proportion sockeye contribute to the Kuskokwim River commercial fishery.

Catchability and Adjusted Passage Index

The 1990 mean catchability adjustment factor for sockeye salmon was 0.9874. The number was derived from only two commercial fishing periods because of the disjunct entry pattern exhibited by sockeye salmon in the test fishery (Figure 8, Appendix E). This mean catchability adjustment factor was the lowest yet recorded and nearly half the 1984-1989 mean of 1.8610 (Appendix D). Similarly, the resulting cumulative adjusted CPUE of 1,100.2 was the lowest cumulative adjusted value yet recorded (Figure 9).⁹ These results were thought to be in error for the same reasons describe above for the unadjusted index and as described for the application of the adjustment factor in general.

Species Composition

The proportion of sockeye salmon in the test fishery, as indexed by the mean daily unadjusted CPUE, was highly variable (Figure 10). The percentage of sockeye in the catch abruptly peaked on 15 June followed by a gradual decline until 17 July when the occurrence of sockeye became negligible. In comparison, the proportion of sockeye salmon in the commercial fishery peaked on 25 June, the second commercial fishing period, and was followed by a decline similar to that described in the test fishery (Figure 10, Appendix G). The first commercial fishing period was restricted to down stream of Bethel.

As in past years, sockeye salmon in 1990 generally comprised a much larger fraction of the test fish catches than of the District 1 commercial catches (Huttunen 1988). This was probably a result of differences in the selectivity of fishing gear.

⁹ No adjustment factor was calculated in 1984 and 1989 due to the disjunct entry pattern. These years also had the lowest cumulative unadjusted CPUE.

Spatial Distribution

The proportion of sockeye salmon in stations I, II and III was 44.0%, 41.9% and 14.1%, respectively (Table 4). This distribution was somewhat different than the 1984-89 averages of 56.5%, 23.6% and 19.9%. Most notably station II had the highest proportion of sockeye yet recorded. The stations I and III were within the range of historic observations. The cause for the difference is unknown.

Chum Salmon

Temporal Distribution

Chum salmon were observed in the Bethel test fishery for a period of 83 days, 6 June to 27 August, but 80% of the test fish catch occurred between 24 June and 20 July (Table 2). The mean date of migration (t) and mean date variance (s^2_t) were 7 July and 118.5 (Appendix C). The mean date was 4 days later than the 1984-1989 average and the latest yet recorded in the test fishery. The variance was only 34 percent of the historic average variance. This was the second lowest variance recorded for chum in the test fishery and implies a more constricted temporal distribution of fish in 1990 than previous years.

Abundance of chum salmon in the 1990 test fish catches occurred as a series of approximately 8 pulses with each pulse lasting 2 to 7 tides (Figure 11). Although tide to tide variability was substantial, the pulses generally increased in magnitude peaking on 5 July then gradually decreased in magnitude. The pulse pattern and tidal variability could not be solely attributed to commercial harvest. As mentioned for chinook salmon the pulses appeared to have a natural component to their occurrence.

Unadjusted Passage Index

Passage of chum salmon out of statistical area 335-12 in 1990, as indexed by the cumulative unadjusted mean tidal CPUE, was 2,723.2 (Table 2). This value was 20 percent below the 1984-1989 average of 3,413.0 (Figure 12, Appendix D). The cumulative unadjusted CPUE of 2,721.9 was most closely aligned with 1989 and 1984.

Historical comparisons of most other 1990 abundance indexes for chum salmon had results similar to the test fishery. For example, as an index of overall abundance the 550,391 chum caught in the District 1 commercial catch was 16 percent lower than the 1984-89 average of 651,970 fish (Francisco, et al. 1991). Also, as an index of fish passage at Bethel the 160,957 chum salmon caught up river of the test fishery in statistical areas 335-13 and 335-14 was 18 percent below the 1984-89 average of 196,898 fish (Appendix F). Finally, the escapement index at Kogrukluk weir of 26,765 chum salmon was 14 percent below the 1984-89 average of 31,121 chum salmon (Francisco, et al. 1991). In contrast, the chum salmon escapement index at Aniak sonar of 300,408 chum salmon was 14 percent above the 1984-89 average of 262,717. The cause for the variable performance of the stocks is not known.

Catchability and Adjusted Passage Index

The 1990 mean catchability adjustment factor for chum salmon was 5.3907. The number was derived from three commercial fishing periods (Appendix E). This adjustment factor was the second highest on record but comparable to the 1984-1989 mean of 4.0925 and well within the historic range of 1.9438 to 6.2654 (Appendix D).

The resulting cumulative adjusted CPUE of 14,658.8 was comparable to the 1984-89 mean of 13,932.5. As with the unadjusted data the cumulative adjusted CPUE was closely aligned with 1989 and 1984, suggesting that the two indexes were comparable (Figure 12). Still, the 1990 cumulative adjusted CPUE was most closely aligned with 1987 which was in contrast to the unadjusted data. Historic District 1 commercial catch results for chum salmon were most similar to the adjusted data (Francisco, et al. 1991). Therefore, the adjusted index is taken to better represent chum salmon passage for 1990.

Species Composition

Chum salmon generally dominated the test fish catch from late June through July as indexed by the mean daily unadjusted CPUE, (Table 5, Figure 13). Although the proportion of chum salmon in the test fish catch was variable the percentage gradually increased through 18 July then quickly declined. By early August chum salmon comprised a negligible proportion of the test fish catch. In comparison, the proportion of chum salmon in the commercial fishery followed a smoother but nearly identical pattern (Figure 12).

Spatial Distribution

The proportion of chum salmon in stations I, II and III was 31.4%, 57.7% and 10.8%, respectively (Table 4). This distribution was considerably different from the 1984-89 averages of 49.2%, 28.0% and 22.8%. The 1990 proportion for station I was within the historic range for that station but station II had the highest proportion yet observed and station III had the lowest proportion yet observed. The cause for the difference is unknown.

Coho Salmon

Temporal Distribution

Coho salmon were observed in the Bethel test fishery for a period of 43 days, 19 July to 30 August, but 80% of the test fish catch occurred between 7 and 26 August (Table 2). The mean date of migration (t) and mean date variance (s^2_t) were 13 August and 59.0 (Appendix C). The mean date was 3 days later than the 1984-1989 average and the second latest yet recorded in the test fishery. The variance was only 32 percent of the historic average variance. This was the second lowest variance recorded for coho in the test fishery and implies a more

constricted temporal distribution of fish in 1990 than previous years.

Abundance of coho salmon in the 1990 test fish catches occurred as a series of approximately 6 pulses with each pulse lasting 4 to 7 tides (Figure 14). Although tide to tide variability was substantial, the pulses generally increased in magnitude peaking on 15 August then quickly decreasing in magnitude. The pulse pattern and tidal variability could not be solely attributed to commercial harvest. The pulses appeared to have a natural component to their occurrence as discussed for chinook salmon.

Three consecutive tides were missed on 16 and 17 August due to a storm event. Interpolation of the missing data was most likely conservative.

Unadjusted Passage Index

Passage of coho salmon out of statistical area 335-12 in 1990, as indexed by the cumulative unadjusted mean tidal CPUE, was 2,484.7 (Table 2). This value was 9 percent above the 1984-1989 average of 2,722.2 (Figure 15, Appendix D). The cumulative unadjusted CPUE was most comparable with 1989.

In contrast, comparisons of 1990 commercial coho catch with historic catch statistics had results different from the unadjusted test fish index. For example, as an index of overall abundance the 412,518 coho caught in the District 1 commercial catch was 31 percent below the 1984-89 average whereas results from the test fishery suggest 9 percent above the historic average (Francisco, et al. 1991). Also, the 1990 District 1 commercial catch was most similar to 1985 instead of 1989 as depicted in the test fishery. Similarly, as an index of fish passage at Bethel the 135,520 coho salmon caught up stream of the test fishery in statistical areas 335-13 and 335-14 was 41 percent below the 1984-89 average, again results from the test fishery suggest 9 percent above (Appendix F). Also, the 1990 commercial coho catch in statistical areas 335-13 and 335-14 was again most similar to 1987 instead of 1989. The discrepancy was largely corrected with the application of the correction factor for catchability.

Catchability and Adjusted Passage Index

The 1990 mean catchability adjustment factor for coho salmon was 2.3260. The number was derived from two commercial fishing periods (Appendix E). This adjustment factor was the second lowest on record but comparable to the 1984-1989 mean of 3.0829 and well within the historic range of 2.2266 to 4.1352 (Appendix D). The resulting cumulative adjusted CPUE was 5,780.3, the lowest to date and 27 percent below the 1984-89 average of 7,918.7. The 1990 cumulative adjusted CPUE was most similar to 1985 (Figure 15). No adjustment factor was calculated for 1989 due to the irregular entry pattern of coho salmon.

The cumulative adjusted CPUE compares much better with historic catch statistics than the unadjusted CPUE. For example, as mentioned earlier the 1990 commercial coho catch was 31 percent below the 1984-89 average, similarly the cumulative adjusted test fish CPUE was 27 percent below average. The commercial coho catch

in statistical areas 335-13 and 335-14 was 41 percent below the 1984-89 average which was closer to the 27 percent below average of the adjusted CPUE data than the 9 percent above average suggested by the unadjusted data (Appendix F).

Species Composition

The daily proportion of coho salmon in the test fishery varied but generally increased rapidly between 19 July and 4 August when the proportion of coho CPUE escalated from 0 to 98% (Figure 16, Table 5). The proportion stayed at, or near 100% for the remainder of the season. The percentage of coho in the commercial catch was similar.

Spatial Distribution

Coho salmon were more evenly distributed across the channel this year than in any other year except 1989 (Table 4). The percent distribution of coho between stations I, II and III, was 36.1%, 37.2%, and 26.7%, respectively. The 1984-89 averages were 56.3%, 21.8% and 21.9% and the 1989 proportions were 35.4%, 35.4% and 29.2%. The cause of the difference is unknown, but because test fishing methods have remained essentially unchanged, the difference was assumed to be caused by natural variation in migratory patterns.

Hydrological Data

Hydrologic data were collected during each tide in which test fishing occurred. Observations included surface water temperature and clarity readings. Water temperatures averaged 14°C with a minimum temperature of 10°C and a maximum temperature of 18°C (Appendix H). The average mean, minimum and maximum temperatures for 1984-89 were 13°C, 8°C and 18°C, suggesting 1990 was warmer than usual.

The mean Secchi depth reading for 1990 was 0.29 m with a range of 0.10 to 0.70 m. For 1984-89 the mean was 0.34 m and the range was 0.11 to 0.79 m.

Bottom profile data was collected at the test fish site in 1990. The channel was generally U-shaped with maximum dimensions of 12 m (36 ft) deep and 320 m (1,050 ft) wide (Figure 17). Gill nets used in the Bethel test fishery generally sampled the upper half of the water column; however, at station I the inshore end of the net generally dragged along a section of sand bar. At station III the inshore end of the net was deployed approximately 8 m (24 ft) offshore to avoid snags along the channels edge. As the station III drift progresses it typically moves towards the center of the channel (Figure 3). The actual distance covered by a drift varied with changes in water velocity.

LITERATURE CITED

- Brannian, L.K. 1988. A review of the estimation of Kuskokwim River annual salmon passage through expansion of test fishing CPUE. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A88-01, Anchorage.
- Francisco, R.K. et al. 1990. 1989 Kuskokwim Area annual management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3B90-25, Anchorage.
- Francisco, R.K. et al. 1991. 1990 Kuskokwim Area annual management report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3B91-11, Anchorage.
- Huttunen, D.C. 1984. 1982-1983 Kuskokwim River test fishing project. AYK Region, Kuskokwim River Salmon Test Fishing Report No. 13. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bethel.
- Huttunen, D.C. 1985. Kuskokwim River salmon test fishing report, 1984. AYK Region, Kuskokwim River Salmon Test Fishing Report No. 15. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bethel.
- Huttunen, D.C. 1988. Kuskokwim River test fishing project, 1987. Alaska Department of Fish & Game, Division of Commercial Fisheries, Regional Information Report 3B88-25, Anchorage.
- Huttunen, D.C. and L.K. Brannian. 1987. 1986 Kuskokwim River salmon abundance estimation based on calibrated test fishing CPUE data. AYK Region, Kuskokwim River Salmon Test Fishing Report No. 17. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bethel.
- Meacham, C.P. 1978. Offshore test fishing in Bristol Bay. Bristol Bay Data Report No. 69. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.
- Mundy, P.R. 1982. Computation of migratory timing statistics for adult chinook salmon in the Yukon River, Alaska, and their relevance to fisheries management. North American Journal of Fisheries Management 4: 359-370.
- Waltemeyer, D.L. 1983. Migratory timing and abundance estimation of the 1982 sockeye salmon return to upper Cook Inlet based on a test fishing program. Cook Inlet Data Rep. No. 83-1. Alaska Department of Fish and Game, Division of Commercial Fisheries, Soldotna.

Table 1. Drift schedule, by mesh size (cm) and station, used in the 1989 Bethel test fishery.^a

Schedule Number	Station 1	Station 2	Station 3
1	20.3 13.6	20.3	13.6
2	20.3	20.3 13.6	13.6
3	20.3 13.6	13.6	20.3
4	20.3	13.6	20.3 13.6
5	13.6	20.3 13.6	20.3
6	13.6	20.3	20.3 13.6

^a Repeating random schedule used throughout the period of test fishing is: 2, 3, 5, 4, 1, 6.

Table 2. Test fishing catch and unadjusted mean tidal CPUE^a
by species for the 1990 Bethel test fishery.

Date	Tide No.	Chinook ^b		Sockeye ^c		Chum ^c		Coho ^c	
		Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
06/01	1	0	0.0	0	0.0	0	0.0	0	0.0
06/02	2	1	1.4	0	0.0	0	0.0	0	0.0
	3		0.7		0.0		0.0		0.0
06/03	4	0	0.0	0	0.0	0	0.0	0	0.0
	5		0.0		0.0		0.0		0.0
06/04	6	0	0.0	0	0.0	0	0.0	0	0.0
	7		0.7		0.0		0.0		0.0
06/05	8	1	1.4	0	0.0	0	0.0	0	0.0
	9	0	0.0	0	0.0	0	0.0	0	0.0
06/06	10	0	0.0	0	0.0	0	0.0	0	0.0
	11	1	1.5	0	0.0	1	2.7	0	0.0
06/07	12	2	2.7	0	0.0	0	0.0	0	0.0
	13	0	0.0	0	0.0	0	0.0	0	0.0
06/08	14	3	4.3	0	0.0	0	0.0	0	0.0
	15	0	0.0	0	0.0	0	0.0	0	0.0
06/09	16	1	1.4	0	0.0	0	0.0	0	0.0
	17		3.2		0.0		0.0		0.0
06/10	18		3.2		0.0		0.0		0.0
	19	3	5.0	0	0.0	0	0.0	0	0.0
06/11	20	6	8.2	2	5.3	0	0.0	0	0.0
	21	4	5.7	1	2.9	0	0.0	0	0.0
06/12	22	4	6.5	1	2.9	1	2.9	0	0.0
	23	5	7.1	0	0.0	0	0.0	0	0.0
06/13	24	3	4.2	0	0.0	0	0.0	0	0.0
	25	1	1.5	0	0.0	0	0.0	0	0.0
06/14	26	0	0.0	2	5.7	1	2.9	0	0.0
	27	2	2.5	4	9.8	4	9.8	0	0.0
06/15	28	6	8.6	5	14.1	0	0.0	0	0.0
06/16	29	4	5.8	7	19.5	1	2.8	0	0.0
	30	4	5.7	0	0.0	0	0.0	0	0.0
06/17	31	1	1.5	5	14.9	0	0.0	0	0.0
	32	3	4.6	15	47.9	7	22.4	0	0.0
06/18	33	3	4.4	0	0.0	4	11.7	0	0.0
	34	6	8.5	6	15.7	3	7.9	0	0.0
06/19	35	8	11.6	2	6.5	2	6.9	0	0.0
	36	10	14.1	12	31.4	8	20.9	0	0.0
06/20	37	5	7.4	9	25.0	2	5.7	0	0.0
	38		4.4		15.4		4.3		0.0
06/21	39	1	1.4	2	5.9	1	3.0	0	0.0
	40	7	10.1	3	9.1	9	27.0	0	0.0

---- continued ----

Table 2. Test fishing catch and unadjusted mean tidal CPUE^a
by species for the 1990 Bethel test fishery (con't).

Date	Tide No.	Chinook ^b		Sockeye ^c		Chum ^c		Coho ^c	
		Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
06/22	41	6	8.6	3	8.2	2	5.5	0	0.0
	42	7	10.1	2	5.7	6	16.9	0	0.0
06/23	43	2	2.7	20	48.7	4	9.6	0	0.0
	44	5	6.6	11	28.3	17	43.6	0	0.0
06/24	45	1	1.5	18	50.1	25	69.4	0	0.0
	46	11	22.1	4	10.2	3	7.7	0	0.0
06/25	47	18	25.1	17	45.8	5	13.8	0	0.0
	48	6	9.1	15	44.8	6	18.0	0	0.0
06/26	49	17	21.4	1	3.1	8	24.6	0	0.0
	50	6	9.3	7	21.4	8	24.4	0	0.0
06/27	51	7	10.3	12	29.8	51	126.7	0	0.0
	52	2	3.1	5	13.6	15	41.6	0	0.0
06/28	53	10	14.1	14	39.0	6	17.3	0	0.0
	54	8	10.6	21	50.9	22	54.6	0	0.0
06/29	55	3	11.5	19	61.0	18	60.0	0	0.0
	56	7	9.9	15	42.7	10	27.0	0	0.0
06/30	57	0	0.0	2	6.0	10	31.7	0	0.0
07/01	58	0	0.0	5	14.7	6	17.5	0	0.0
	59	1	1.5	3	9.2	16	49.9	0	0.0
07/02	60	1	1.6	1	3.2	4	12.9	0	0.0
	61	5	7.8	7	20.9	5	14.6	0	0.0
07/03	62	9	11.1	23	41.6	78	135.7	0	0.0
	63	4	5.9	8	23.5	22	64.7	0	0.0
07/04	64	10	14.2	21	56.7	32	86.3	0	0.0
	65		5.5		39.3		127.4		0.0
07/05	66	1	1.0	11	22.0	83	168.5	0	0.0
	67		4.4		0.0		19.5		0.0
07/06	68	3	4.4	0	0.0	7	19.5	0	0.0
	69	1	1.4	1	3.0	2	6.3	0	0.0
07/07	70	4	4.8	9	20.1	72	160.1	0	0.0
	71	2	2.8	1	2.7	4	13.3	0	0.0
07/08	72	6	8.4	17	38.4	45	103.1	0	0.0
	73	4	6.0	0	0.0	11	32.6	0	0.0
07/09	74	1	1.5	10	28.6	17	48.6	0	0.0
	75	2	3.3	0	0.0	4	12.4	0	0.0
07/10	76	0	0.0	3	7.7	14	36.2	0	0.0
	77	0	0.0	2	6.3	14	45.3	0	0.0
07/11	78	0	0.0	4	6.4	27	45.0	0	0.0
07/12	79	0	0.0	0	0.0	15	33.4	0	0.0
	80	0	0.0	1	2.1	26	45.8	0	0.0

----- continued -----

Table 2. Test fishing catch and unadjusted mean tidal CPUE^a
by species for the 1990 Bethel test fishery (con't).

Date	Tide No.	Chinook ^b		Sockeye ^c		Chum ^c		Coho ^c	
		Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
07/13	81	2	3.9	1	1.9	14	27.7	0	0.0
	82	0	0.0	3	5.9	9	16.6	0	0.0
07/14	83	1	2.1	1	2.1	3	6.2	0	0.0
	84	0	0.0	2	5.7	11	29.0	0	0.0
07/15	85	1	2.1	0	0.0	2	4.1	0	0.0
	86	1	2.1	2	4.1	5	10.2	0	0.0
07/16	87	0	0.0	2	4.0	7	13.8	0	0.0
	88	0	0.0	2	4.1	2	4.1	0	0.0
07/17	89	1	1.9	0	0.0	18	33.3	0	0.0
	90	1	2.1	0	0.0	12	24.3	0	0.0
07/18	91	0	0.0	0	0.0	19	34.5	0	0.0
	92	0	0.0	0	0.0	10	24.3	0	0.0
07/19	93	0	0.0	1	2.0	3	5.8	1	1.8
	94	0	0.0	0	0.0	32	60.7	1	2.0
07/20	95	0	0.0	0	0.0	24	45.9	6	11.2
	96	0	0.0	0	0.0	13	27.0	1	2.1
07/21	97	0	0.0	0	0.0	19	36.5	3	6.2
	98	0	0.0	0	0.0	11	20.5	2	3.6
07/22	99	0	0.0	0	0.0	15	27.4	1	2.0
	100	2	3.7	0	0.0	7	12.5	3	5.2
07/23	101	0	0.0	0	0.0	12	19.6	2	3.2
	102	0	0.0	0	0.0	7	15.0	0	0.0
07/24	103	1	2.0	0	0.0	10	20.0	2	4.0
	104	0	0.0	0	0.0	2	4.1	2	4.1
07/25	105	0	0.0	0	0.0	2	3.8	1	2.1
	106	0	0.0	0	0.0	2	4.2	0	0.0
07/26	107	1	2.0	0	0.0	0	0.0	1	1.8
07/27	108	1	2.1	0	0.0	1	2.1	0	0.0
	109	0	0.0	0	0.0	4	8.1	5	10.0
07/28	110	0	0.0	0	0.0	5	10.3	2	4.2
	111	0	0.0	1	1.8	9	16.9	20	38.4
07/29	112		2.1		0.0		17.7		24.3
	113	2	4.1	0	0.0	9	18.5	5	10.3
07/30	114	0	0.0	0	0.0	9	17.6	4	7.7
	115		0.0		1.0		8.8		3.8
07/31	116	0	0.0	1	2.1	0	0.0	0	0.0
	117	0	0.0	0	0.0	1	2.0	5	10.1
08/01	118	0	0.0	0	0.0	1	2.1	7	14.2
	119		0.0		0.0		3.7		11.4
08/02	120	0	0.0	0	0.0	2	3.7	6	11.4

---- continued ----

Table 2. Test fishing catch and unadjusted mean tidal CPUE^a
by species for the 1990 Bethel test fishery (con't).

Date	Tide No.	Chinook ^b		Sockeye ^c		Chum ^c		Coho ^c	
		Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
08/03	121	0	0.0	0	0.0	1	2.1	5	10.4
	122	0	0.0	0	0.0	2	3.6	8	14.5
	123	0	0.0	0	0.0	1	2.1	3	6.1
08/04	124	0	0.0	0	0.0	0	0.0	15	26.8
	125	0	0.0	0	0.0	1	1.9	14	27.0
08/05	126		0.0	0	0.0		1.0		30.7
	127	0	0.0	0	0.0	0	0.0	17	34.4
08/06	128	1	1.7	1	1.7	11	19.3	35	64.3
	129		0.0		0.0		4.0		14.1
08/07	130	0	0.0	0	0.0	2	4.0	7	14.1
	131	0	0.0	0	0.0	1	2.0	18	35.9
08/08	132	0	0.0	0	0.0	0	0.0	20	36.1
	133	0	0.0	0	0.0	0	0.0	18	36.9
08/09	134	0	0.0	0	0.0	1	2.0	54	95.9
	135	0	0.0	0	0.0	1	2.0	11	21.8
08/10	136	1	2.0	0	0.0	1	1.9	26	48.5
	137	0	0.0	0	0.0	0	0.0	5	9.9
08/11	138	0	0.0	0	0.0	1	2.0	10	20.2
	139	0	0.0	0	0.0	0	0.0	22	43.9
08/12	140	0	0.0	0	0.0	0	0.0	59	112.2
	141	0	0.0	0	0.0	2	3.8	53	97.5
08/13	142	0	0.0	0	0.0	0	0.0	43	79.0
	143	0	0.0	0	0.0	0	0.0	56	100.6
08/14	144		0.0		0.0	0	0.0		166.3
	145	1	1.7	0	0.0	0	0.0	128	231.7
08/15	146	0	0.0	0	0.0	1	2.1	13	26.6
	147	0	0.0	0	0.0	1	1.9	33	62.2
08/16	148		0.0		0.0		0.0		45.3
	149		0.0		0.0		0.0		45.3
08/17	150		0.0		0.0		0.0		45.3
	151	0	0.0	0	0.0	0	0.0	24	45.3
08/18	152	0	0.0	0	0.0	0	0.0	20	40.6
	153	0	0.0	0	0.0	0	0.0	28	52.9
08/19	154	0	0.0	0	0.0	0	0.0	4	8.3
	155	0	0.0	0	0.0	0	0.0	29	55.0
08/20	156		0.0		0.0		0.0		28.3
	157	0	0.0	0	0.0	0	0.0	14	28.3
08/21	158	0	0.0	0	0.0	0	0.0	5	10.4
	159	0	0.0	0	0.0	1	1.9	18	35.0
08/22	160	0	0.0	0	0.0	0	0.0	17	33.6

----- continued -----

Table 2. Test fishing catch and unadjusted mean tidal CPUE^a
by species for the 1990 Bethel test fishery (con't).

Date	Tide No.	Chinook ^b		Sockeye ^c		Chum ^c		Coho ^c	
		Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
08/23	161	0	0.0	0	0.0	0	0.0	55	104.2
	162	0	0.0	0	0.0	0	0.0	13	26.8
08/24	163	0	0.0	0	0.0	0	0.0	8	16.5
	164	0	0.0	0	0.0	0	0.0	11	23.4
08/25	165	0	0.0	0	0.0	0	0.0	9	16.8
	166	0	0.0	0	0.0	0	0.0	24	44.1
08/26	167	0	0.0	0	0.0	0	0.0	19	36.4
	168	1	1.9	0	0.0	0	0.0	10	19.7
08/27	169	0	0.0	0	0.0	1	1.8	16	29.2
	170	0	0.0	0	0.0	0	0.0	5	9.5
08/28	171	0	0.0	0	0.0	0	0.0	1	1.8
08/29	172	0	0.0	0	0.0	0	0.0	1	2.9
	173	0	0.0	0	0.0	0	0.0	5	9.7
08/30	174	0	0.0	0	0.0	0	0.0	4	7.8
	175	0	0.0	0	0.0	0	0.0	0	0.0
08/31	176	0	0.0	0	0.0	0	0.0	0	0.0
TOTALS		283	447.9	406	1123.9	1105	2723.2	1093	2484.7

^a For tides in which catch information is missing the CPUE is interpolated between the preceeding and following tide, except when the tide was missed due to the co-occurrence of a commercial fishing period in which case the estimate is based on the following tide only.

^b Includes fish caught in 13.6 cm (5-3/8 in) and 20.3 cm (8 in) mesh gill nets.

^c Includes fish caught in 13.6 cm (5-3/8 in) mesh gill nets only.

Table 3. Cumulative drift CPUE by year and gill net mesh size for chinook salmon caught in the Bethel test fishery through through 10 July of each year.^a

Year	Total ^b Drift CPUE	13.6 cm mesh		20.3 cm mesh	
		CPUE	%	CPUE	%
1984	485.1	280.1	57.8	204.9	42.2
1985	370.0	194.9	52.7	175.1	47.3
1986	326.7	227.3	69.6	99.4	30.4
1987	2081.5	1390.7	66.8	690.8	33.2
1988	1219.6	685.7	56.2	533.9	43.8
1989	1778.5	1115.9	62.7	663.4	37.3
1990	1633.4	755.6	46.3	877.8	53.7
Mean:	1127.8	664.3	58.9	463.6	41.1

^a Cumulative drift CPUE is an unweighted sum of all drift CPUE indices; it is different from the mean tidal CPUE reported in Table 2.

^b Does not include estimated CPUE for missed drifts.

Table 4. Cumulative drift CPUE by station and species for the Bethel test fishery, 1984-1990.^a

Species	Year	Total Drift CPUE	Station I		Station II		Station III	
			CPUE	%	CPUE	%	CPUE	%
Chinook	1984	928.2	380.5	41.0	158.6	17.1	389.1	41.9
	1985	398.5	280.5	70.4	47.3	11.9	70.7	17.7
	1986	583.7	278.9	47.8	164.6	28.2	140.2	24.0
	1987	2248.8	1021.9	45.4	552.3	24.6	674.6	30.0
	1988	1343.6	808.2	60.2	185.7	13.8	349.7	26.0
	1989	1872.0	1221.2	65.2	135.0	7.2	515.9	27.6
	1990	1633.3	700.5	42.9	502.4	30.8	430.5	26.4
Mean:		1286.9	670.2	53.3	249.4	19.1	367.2	27.7
Sockeye	1984	1260.7	705.6	56.0	308.0	24.4	247.0	19.6
	1985	3210.4	1977.8	61.6	724.4	22.6	508.2	15.8
	1986	11528.6	6354.0	55.1	2417.1	21.0	2757.6	23.9
	1987	5375.8	2285.3	42.5	1391.1	25.9	1699.5	31.6
	1988	3106.2	1968.5	63.4	683.1	22.0	454.6	14.6
	1989	1723.9	1046.7	60.7	442.2	25.7	235.0	13.6
	1990	2344.6	1031.6	44.0	982.4	41.9	330.7	14.1
Mean:		4078.6	2195.6	54.8	992.6	26.2	890.4	19.0
Chum	1984	5048.2	2382.7	47.2	1167.1	23.1	1498.4	29.7
	1985	2784.9	2042.4	73.3	353.1	12.7	389.4	14.0
	1986	7762.3	3186.9	41.1	2791.9	36.0	1783.5	23.0
	1987	12838.9	4266.5	33.2	4259.1	33.2	4313.3	33.6
	1988	11048.5	5593.9	50.6	3320.5	30.1	2134.2	19.3
	1989	6306.8	3147.7	49.9	2077.6	32.9	1081.5	17.1
	1990	6295.9	1978.8	31.4	3634.0	57.7	683.1	10.8
Mean:		7440.8	3228.4	46.7	2514.8	32.2	1697.6	21.1
Coho	1984	8928.8	4791.5	53.7	1506.7	16.9	2630.6	29.5
	1985	4334.9	3211.5	74.1	653.6	15.1	469.8	10.8
	1986	11528.6	6354.0	55.1	2417.1	21.0	2757.6	23.9
	1987	7155.7	5043.4	70.5	530.6	7.4	1581.7	22.1
	1988	11200.3	5489.2	49.0	3897.5	34.8	1813.6	16.2
	1989	9565.8	3386.6	35.4	3388.6	35.4	2790.7	29.2
	1990	6256.1	2257.2	36.1	2329.3	37.2	1669.6	26.7
Mean:		8424.3	4361.9	53.4	2103.3	24.0	1959.1	22.6

^a Cumulative drift CPUE is an unweighted sum of all drift CPUE indices; therefore, it is different from the mean tidal CPUE reported in Table 2.

Table 5. Daily catch composition of the 1990 Bethel test fishery and District 1 commercial fishery (con't).

Date	Test Fishery (% Mean Daily CPUE)				Commercial Catch (% Fish Landed)			
	Chinook	Sockeye	Coho	Chum	Chinook	Sockeye	Coho	Chum
07/27	0.0	0.0	56.5	43.5				
07/28	2.0	1.8	34.2	62.0				
07/29	7.1	0.0	62.1	30.9				
07/30	0.0	7.6	64.4	28.1				
07/31	0.0	14.6	13.9	71.6				
08/01	0.0	0.0	18.4	81.6	0.8	1.6	27.1	70.5
08/02	0.0	0.0	21.1	78.9				
08/03	0.0	0.0	21.4	78.6				
08/04	0.0	0.0	3.4	96.6				
08/05	0.0	0.0	1.4	98.6				
08/06	1.7	1.7	22.1	74.5	0.5	0.2	6.9	92.4
08/07	0.0	0.0	10.6	89.4				
08/08	0.0	0.0	0.0	100.0				
08/09	0.0	0.0	3.2	96.8				
08/10	3.2	0.0	3.0	93.8	0.2	0.1	2.1	97.6
08/11	0.0	0.0	3.0	97.0				
08/12	0.0	0.0	1.8	98.2				
08/13	0.0	0.0	0.0	100.0	0.3	0.4	4.2	95.1
08/14	0.0	0.0	0.0	100.0				
08/15	0.6	0.0	0.8	98.6				
08/16	0.0	0.0	1.7	98.3	0.0	0.0	0.3	99.6
08/17	0.0	0.0	0.0	100.0				
08/18	0.0	0.0	0.0	100.0				
08/19	0.0	0.0	0.0	100.0				
08/20	0.0	0.0	0.0	100.0	0.0	0.1	0.2	99.7
08/21	0.0	0.0	0.0	100.0				
08/22	0.0	0.0	2.7	97.3				
08/23	0.0	0.0	0.0	100.0				
08/24	0.0	0.0	0.0	100.0				
08/25	0.0	0.0	0.0	100.0				
08/26	3.3	0.0	0.0	96.7				
08/27	0.0	0.0	4.4	95.6	0.0	0.1	0.2	99.7
08/28	0.0	0.0	0.0	100.0				
08/29	0.0	0.0	0.0	100.0				
08/30	0.0	0.0	0.0	100.0				
08/31	0.0	0.0	0.0	0.0				

Table 5. Daily catch composition of the 1990 Bethel test fishery and District 1 commercial fishery.

Date	Test Fishery (% Mean Daily CPUE)				Commercial Catch (% Fish Landed)			
	Chinook	Sockeye	Chum	Coho	Chinook	Sockeye	Chum	Coho
06/01	0.0	0.0	0.0	0.0				
06/02	100.0	0.0	0.0	0.0				
06/03	0.0	0.0	0.0	0.0				
06/04	100.0	0.0	0.0	0.0				
06/05	100.0	0.0	0.0	0.0				
06/06	34.8	0.0	65.2	0.0				
06/07	100.0	0.0	0.0	0.0				
06/08	100.0	0.0	0.0	0.0				
06/09	100.0	0.0	0.0	0.0				
06/10	100.0	0.0	0.0	0.0				
06/11	62.9	37.1	0.0	0.0				
06/12	69.9	15.1	15.1	0.0				
06/13	100.0	0.0	0.0	0.0				
06/14	8.0	50.7	41.3	0.0				
06/15	37.9	62.1	0.0	0.0				
06/16	33.9	57.8	8.3	0.0				
06/17	6.7	68.8	24.5	0.0				
06/18	26.9	32.6	40.6	0.0				
06/19	28.1	41.5	30.4	0.0				
06/20	18.3	63.8	17.9	0.0	29.1	18.0	52.9	0.0
06/21	20.4	26.4	53.1	0.0				
06/22	34.0	25.3	40.7	0.0				
06/23	6.7	55.2	38.1	0.0				
06/24	14.6	37.5	47.9	0.0				
06/25	21.8	57.9	20.3	0.0	15.7	26.5	57.8	0.0
06/26	29.5	23.5	47.0	0.0				
06/27	5.9	19.3	74.8	0.0				
06/28	13.3	48.2	38.6	0.0				
06/29	10.1	48.9	41.0	0.0	9.1	18.2	72.6	0.0
06/30	0.0	15.9	84.1	0.0				
07/01	1.7	25.7	72.6	0.0				
07/02	15.4	39.5	45.1	0.0				
07/03	6.0	23.0	70.9	0.0				
07/04	6.0	29.1	64.9	0.0				
07/05	2.5	10.2	87.3	0.0	4.0	10.6	85.4	0.0
07/06	16.6	8.7	74.7	0.0				
07/07	3.7	11.1	85.1	0.0				
07/08	7.6	20.4	72.0	0.0				
07/09	5.0	30.3	64.7	0.0	2.7	8.5	88.8	0.0
07/10	0.0	14.6	85.4	0.0				
07/11	0.0	7.6	92.4	0.0				
07/12	4.8	4.9	90.3	0.0				
07/13	6.3	24.3	69.4	0.0				
07/14	5.0	13.9	81.1	0.0	2.4	6.3	91.2	0.1
07/15	6.2	23.8	70.0	0.0				
07/16	4.3	9.5	86.2	0.0				
07/17	7.8	0.0	92.2	0.0				
07/18	0.0	0.0	100.0	0.0				
07/19	0.0	2.8	92.1	5.1				
07/20	0.0	0.0	84.6	15.4				
07/21	0.0	0.0	85.3	14.7				
07/22	7.3	0.0	78.5	14.2				
07/23	0.0	0.0	91.5	8.5				
07/24	5.8	0.0	70.5	23.7				
07/25	0.0	0.0	79.6	20.4				
07/26	50.8	0.0	26.4	22.8				

----- continued -----

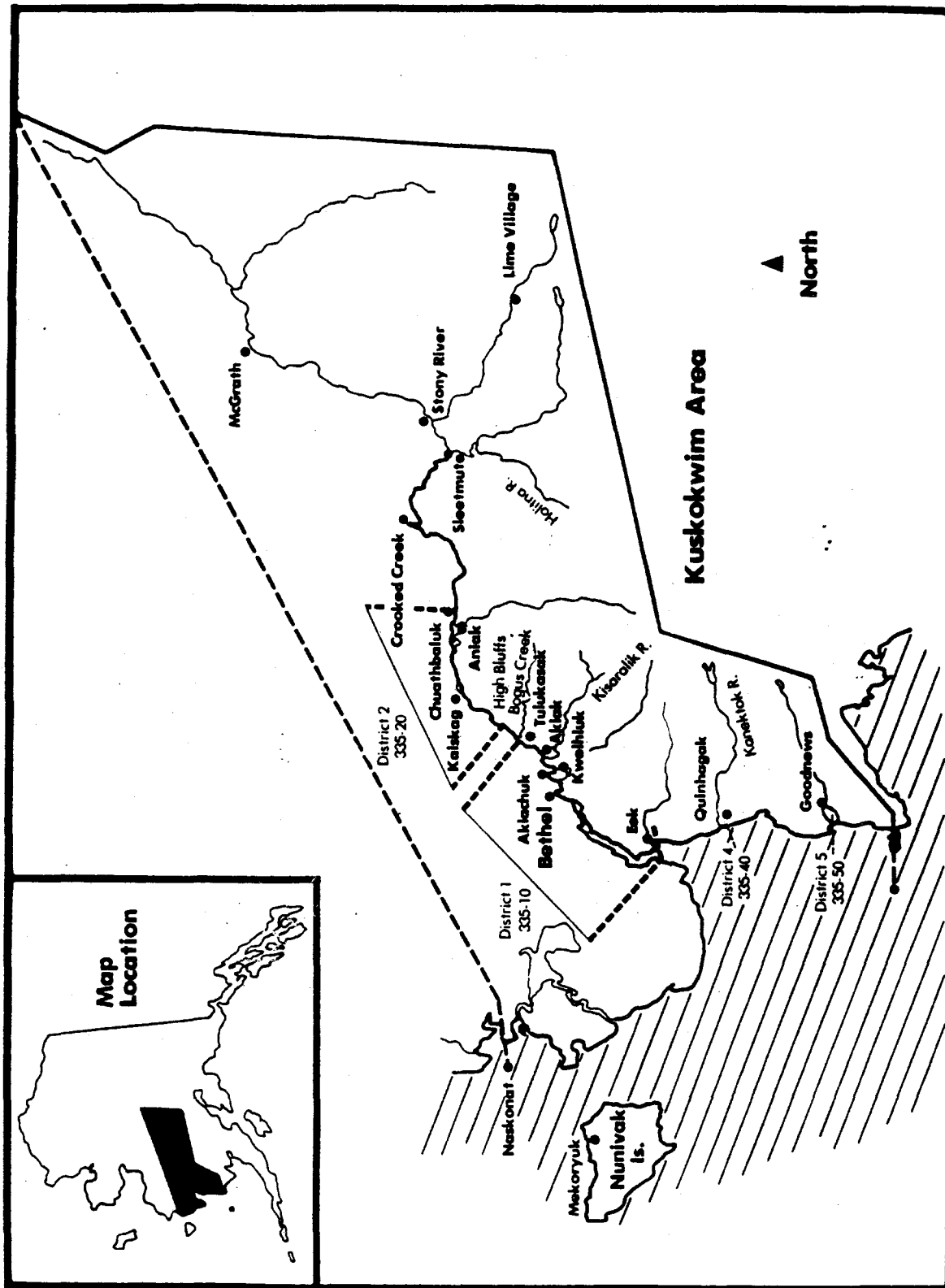




Figure 1. Kuskokwim Area commercial fishing districts.

**Kuskokwim Mangement Area
District W-1
Kuskokwim River**

 Closed to Commercial Fishing
 Closed to Subsistence Fishing
 before, during, and after
 commercial periods in district 1

Stat. Area 335-12

Stat. Area 335-13

Bethel

Kwethluk

Johnson River

Stat. Area 335-11



A

**Kuskokwim Mangement Area
District W-1
Kuskokwim River**

Stat. Area
335-14

Tuluksak

Akiak

Bethel

Stat. Area
335-13



Kwethluk

Stat. Area
335-12

Johnson River

Lomavik Slough

Stat. Area
335-11

 Closed to Commercial Fishing
 Closed to Subsistence Fishing
 Before, During, and After
 Commercial Periods in District 1

North

0 10
Miles

B

Figure 2. Kuskokwim Area district 1 statistical areas in 1988-89 (A) and 1990 (B).

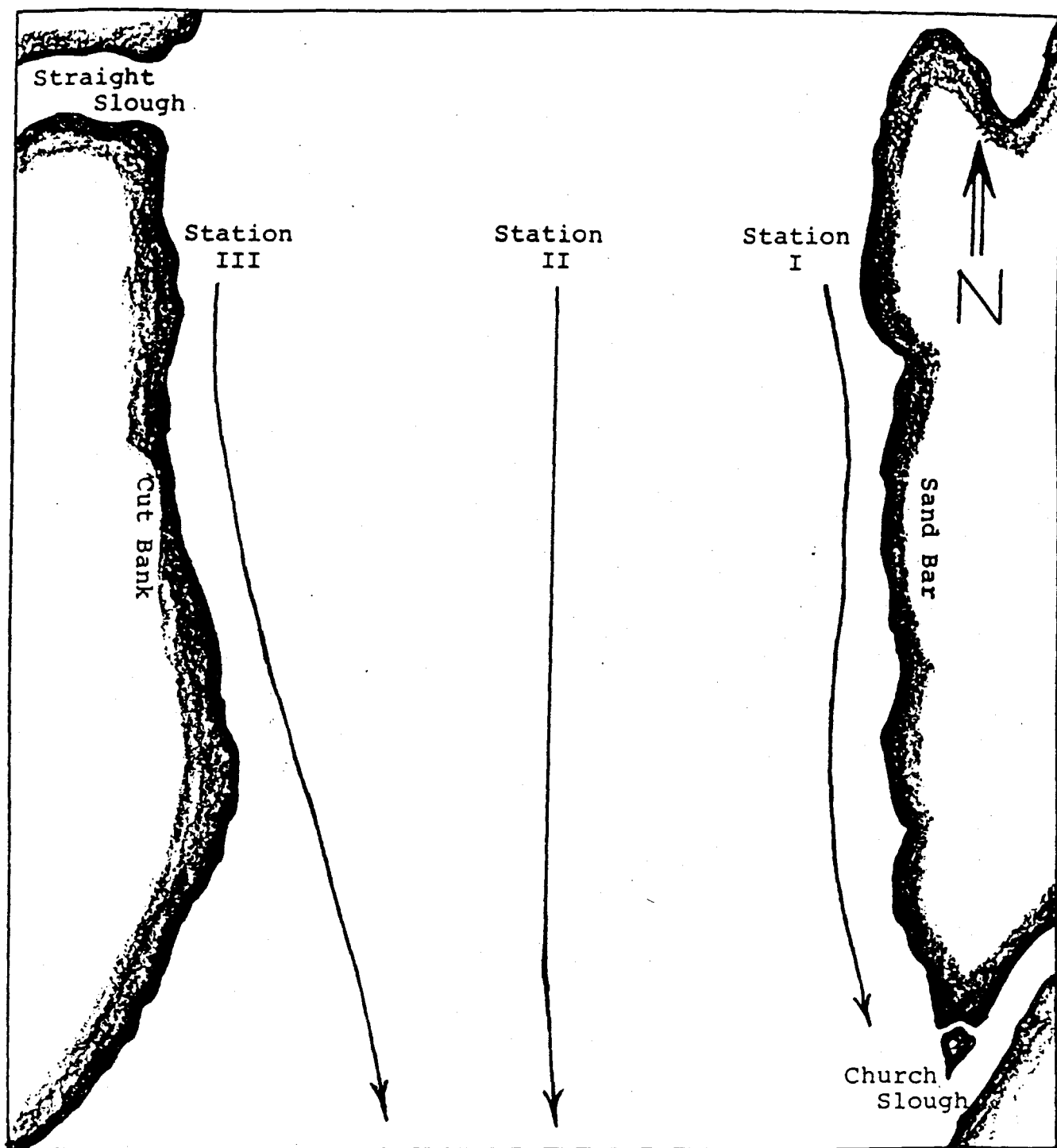


Figure 3. Approximate location of drift stations used in the 1990 Bethel test fish program (not drawn to scale).

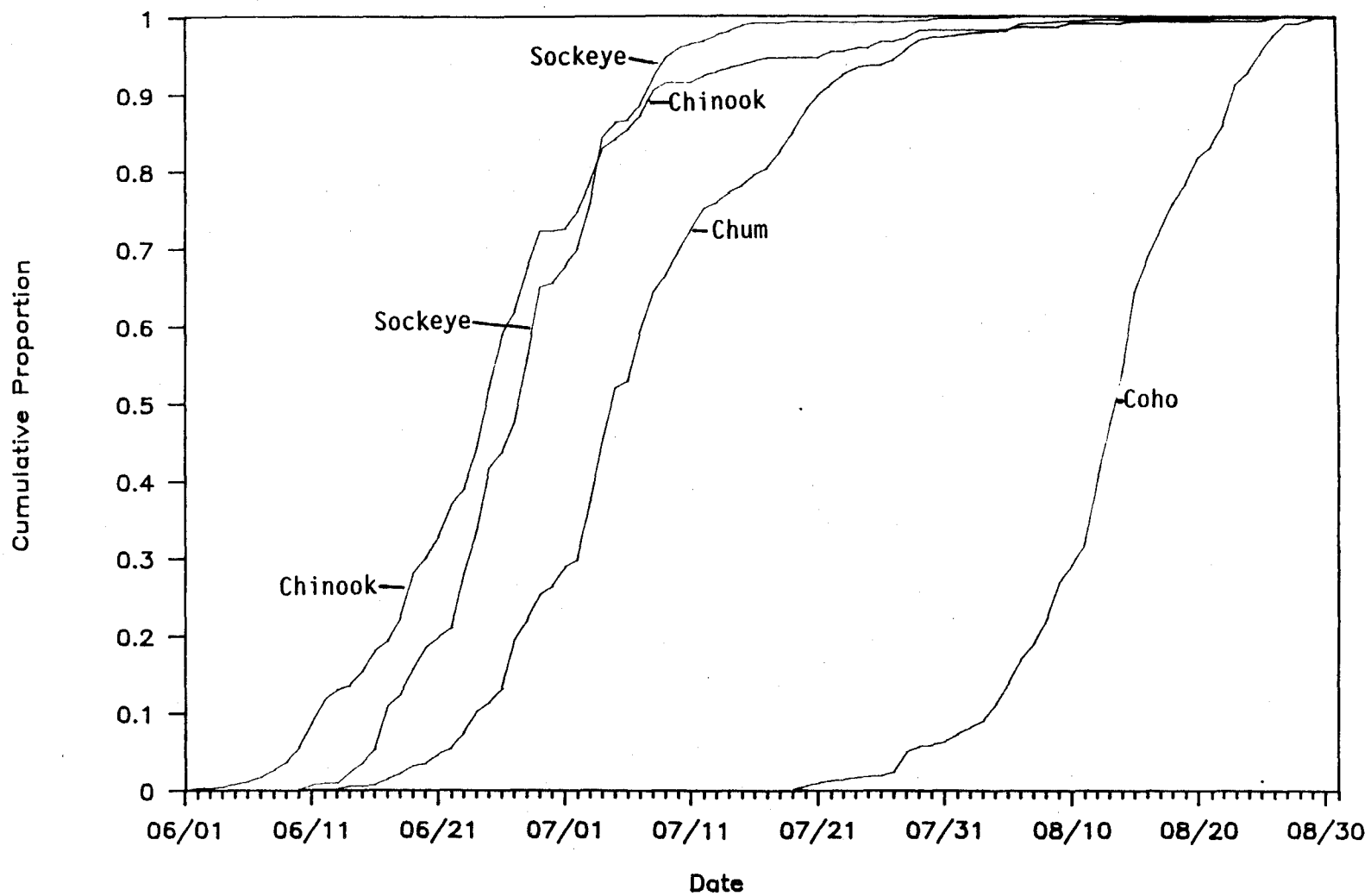


Figure 4. Cumulative proportions of unadjusted mean tidal CPUE for salmon caught in the 1990 Bethel test fishery.

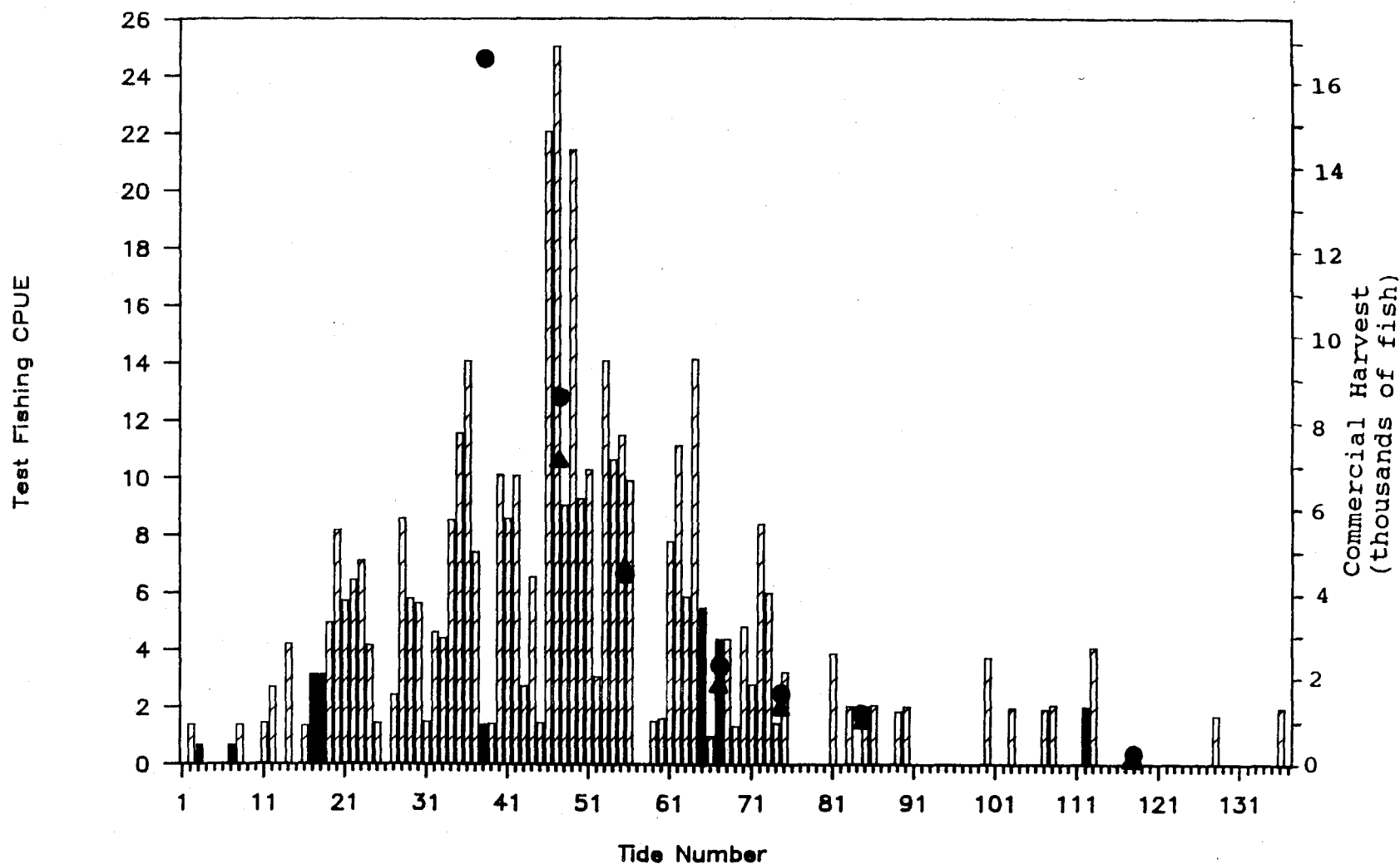


Figure 5. Comparison of the unadjusted 1990 mean tidal CPUE for chinook salmon caught in the Bethel test fishery (bars) and the District 1 chinook salmon commercial harvest, by period, and separated by catches made down stream (●) and up stream (▲) of the Bethel test fishery. Solid bars are used where CPUE was estimated.

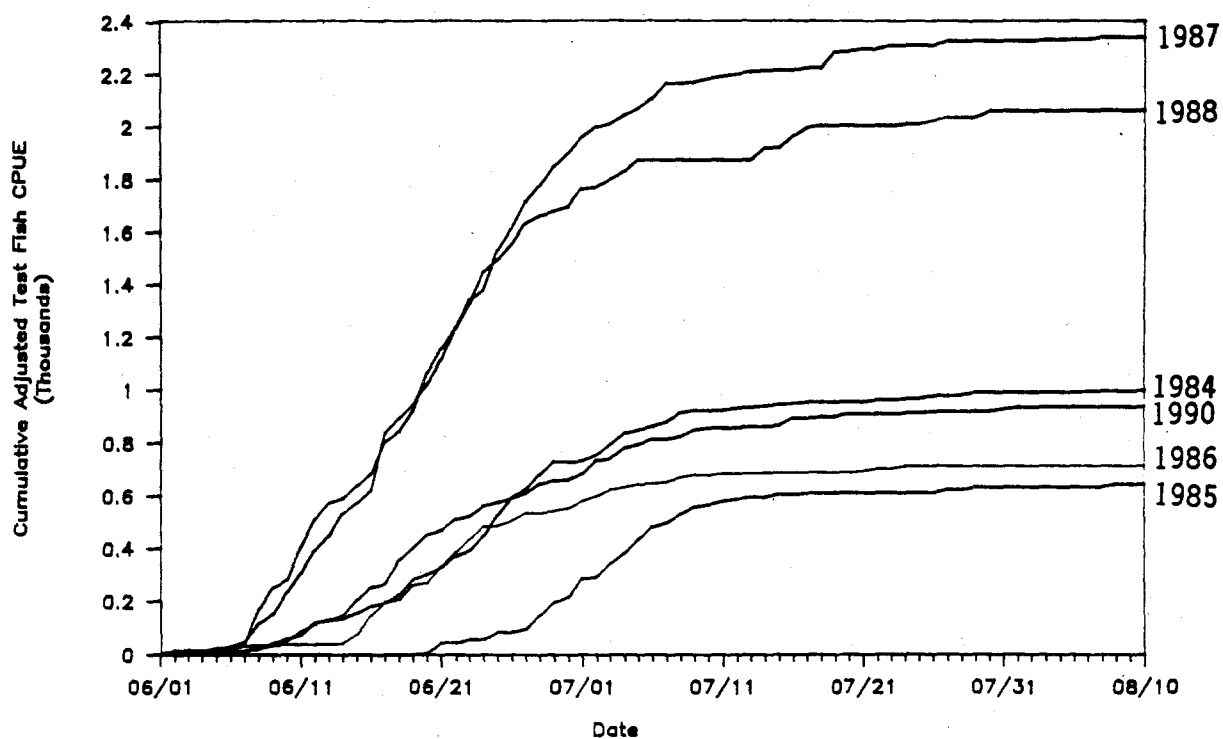
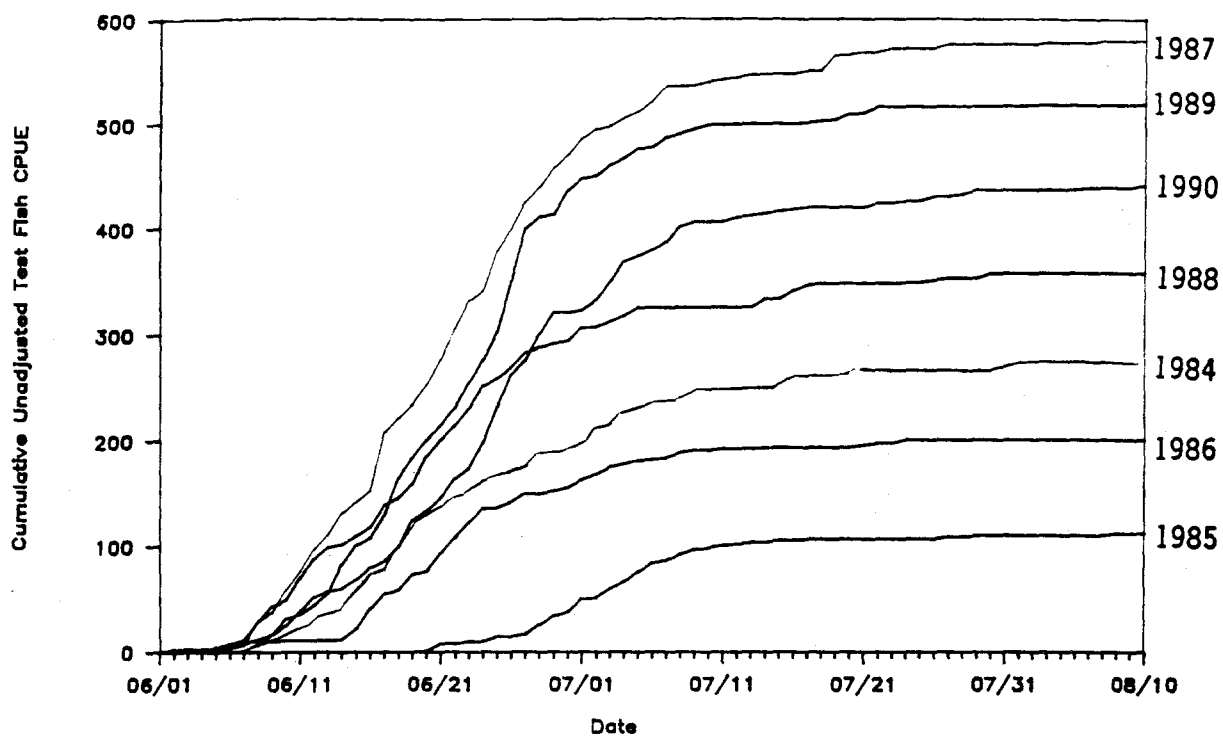


Figure 6. Cumulative unadjusted (top) and adjusted (bottom) mean tidal CPUE of chinook salmon from the 1984 - 1990 Bethel test fishery. Adjusted CPUE was not calculated in 1989 because of assumption violations.

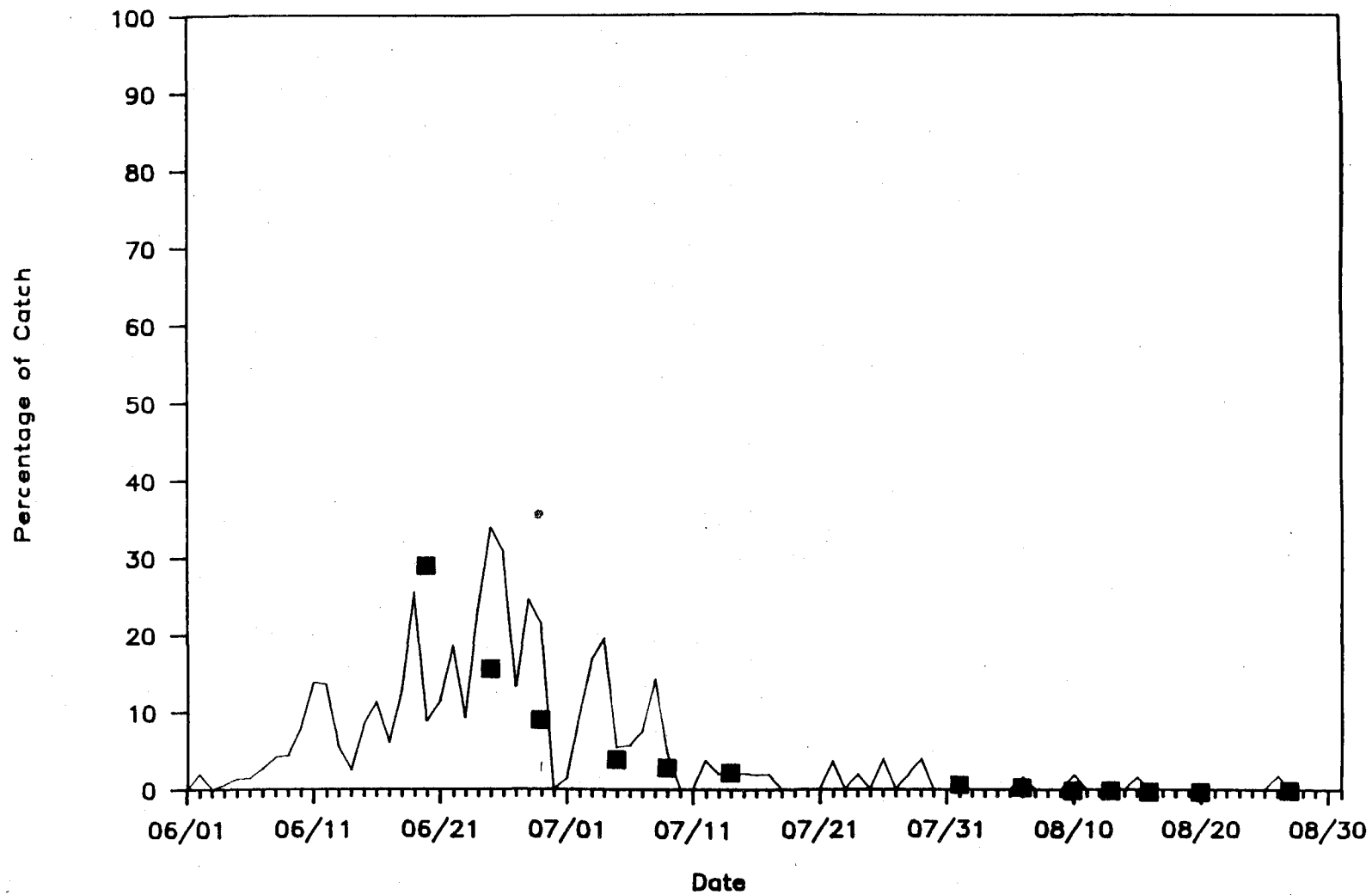


Figure 7. Proportion of chinook salmon in the daily catches of the 1990 Bethel test fishery (line) and the District 1 commercial fishery (■).

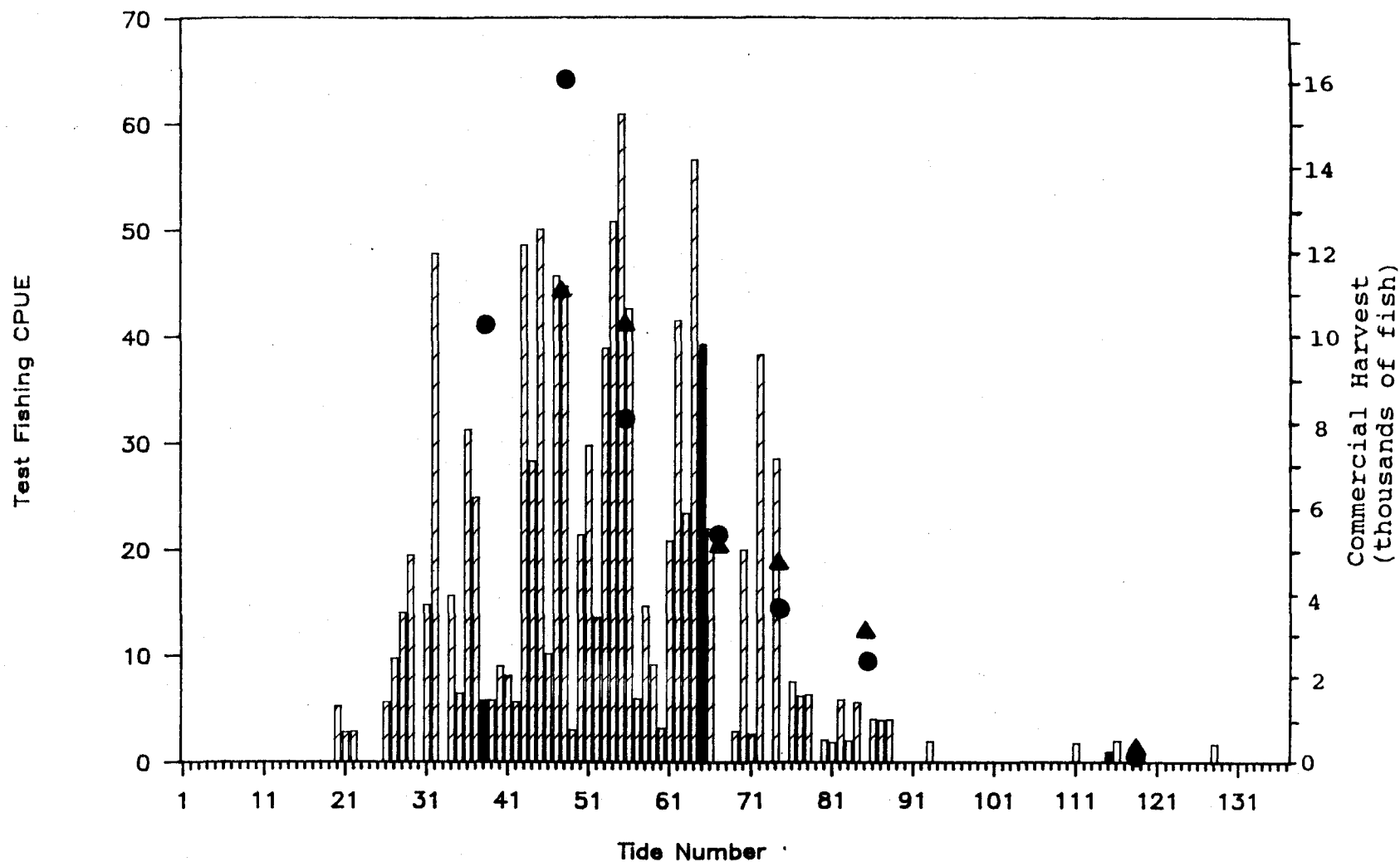


Figure 8. Comparison of the unadjusted 1990 mean tidal CPUE for sockeye salmon caught in the Bethel test fishery (bars) and the District 1 sockeye salmon commercial harvest, by period, and separated by catches made down stream (●) and up stream (▲) of the Bethel test fishery. Solid bars are used where CPUE was estimated.

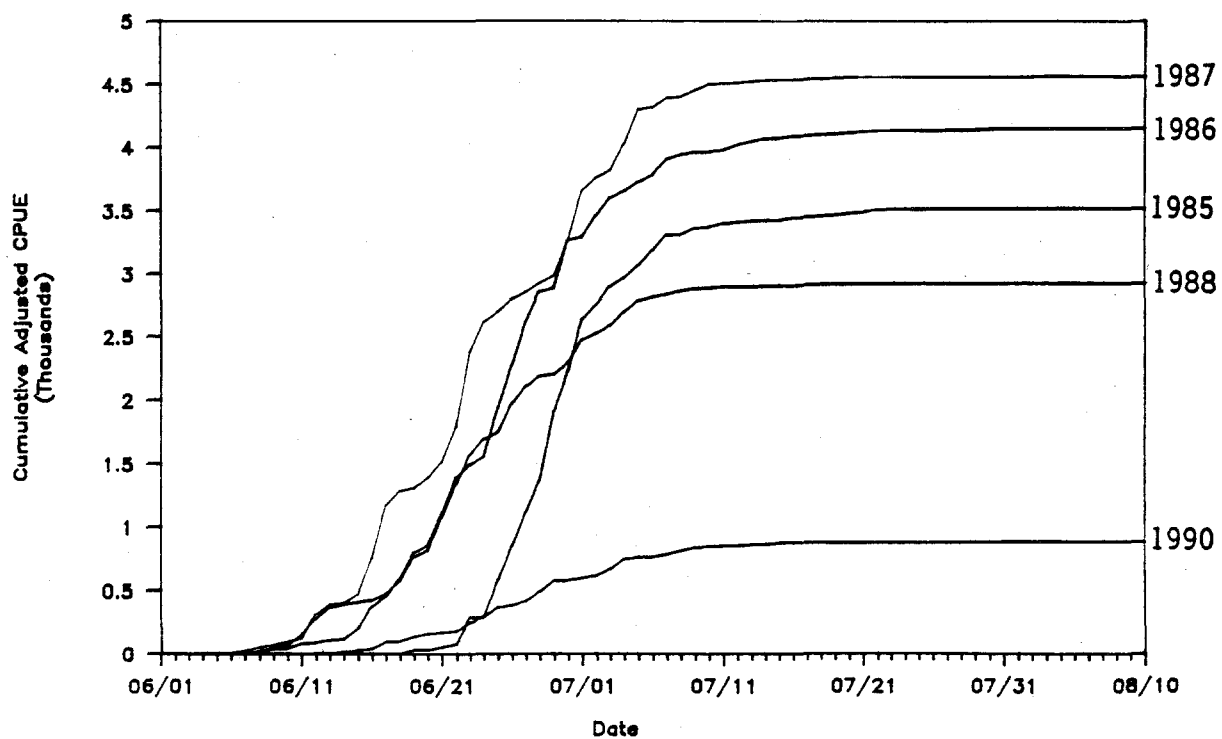
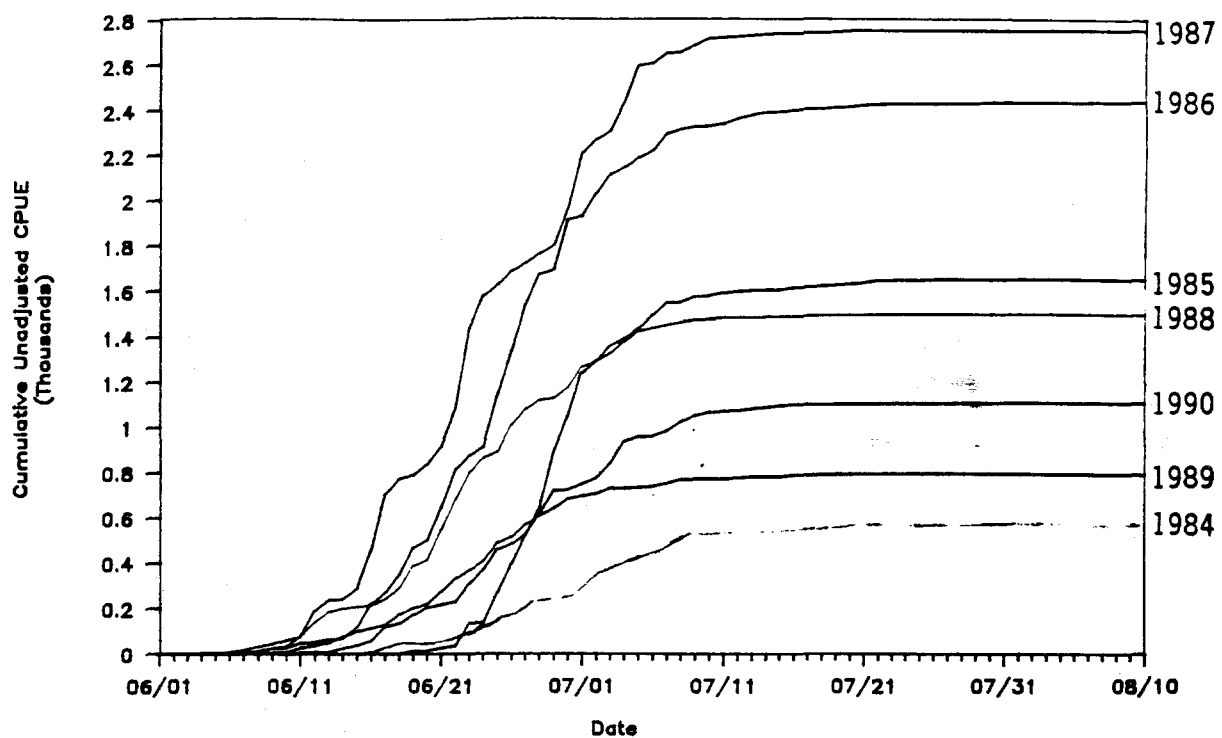


Figure 9. Cumulative unadjusted (top) and adjusted (bottom) mean tidal CPUE of sockeye salmon from the 1984 - 1990 Bethel test fishery. Adjusted CPUE was not calculated in 1984 and 1989 because of assumption violations.

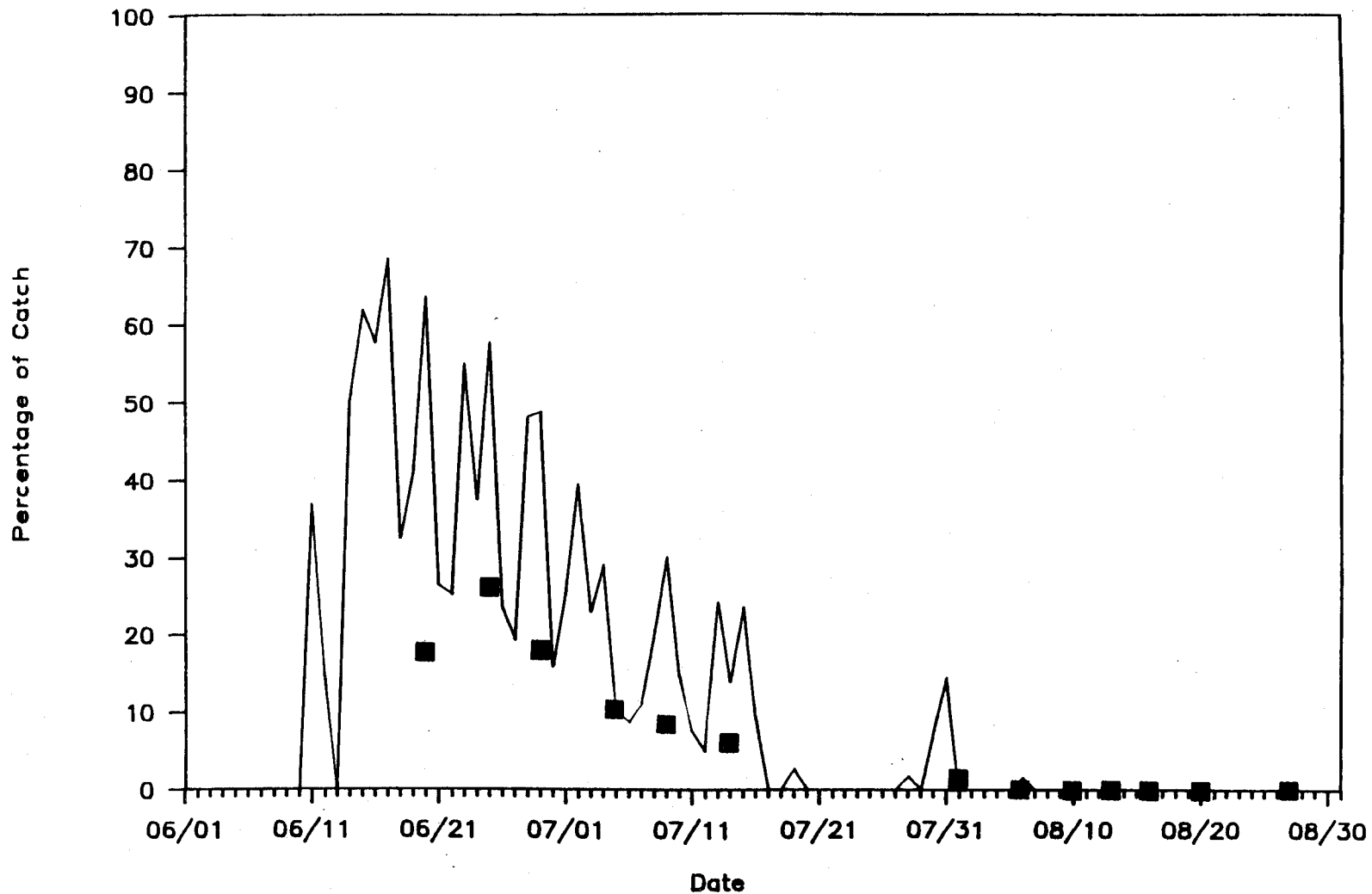


Figure 10. Proportion of sockeye salmon in the daily catches of the 1990 Bethel test fishery (line) and the District 1 commercial fishery (■).

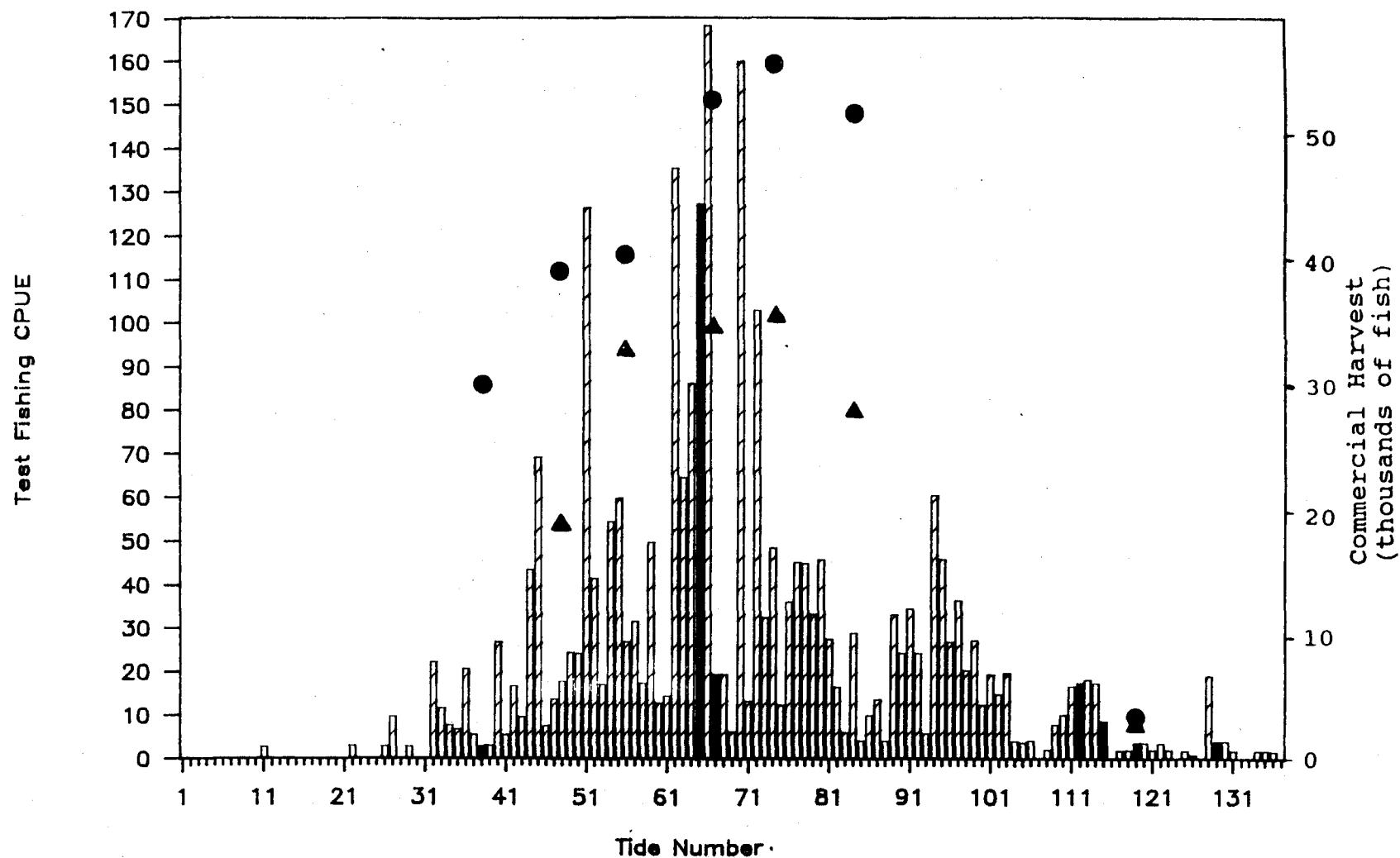


Figure 11. Comparison of the unadjusted 1990 mean tidal CPUE for chum salmon caught in the Bethel test fishery (bars) and the District 1 chum salmon commercial harvest, by period, and separated by catches made down stream (●) and up stream (▲) of the Bethel test fishery. Solid bars are used where CPUE was estimated.

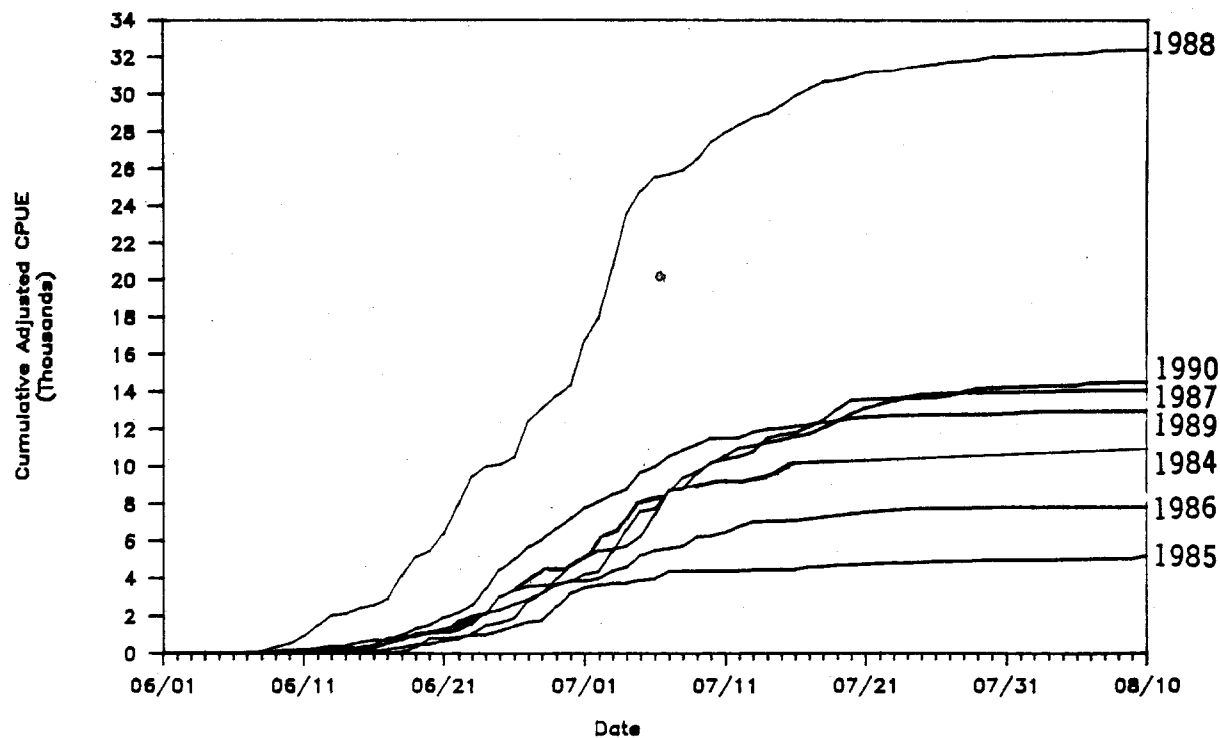
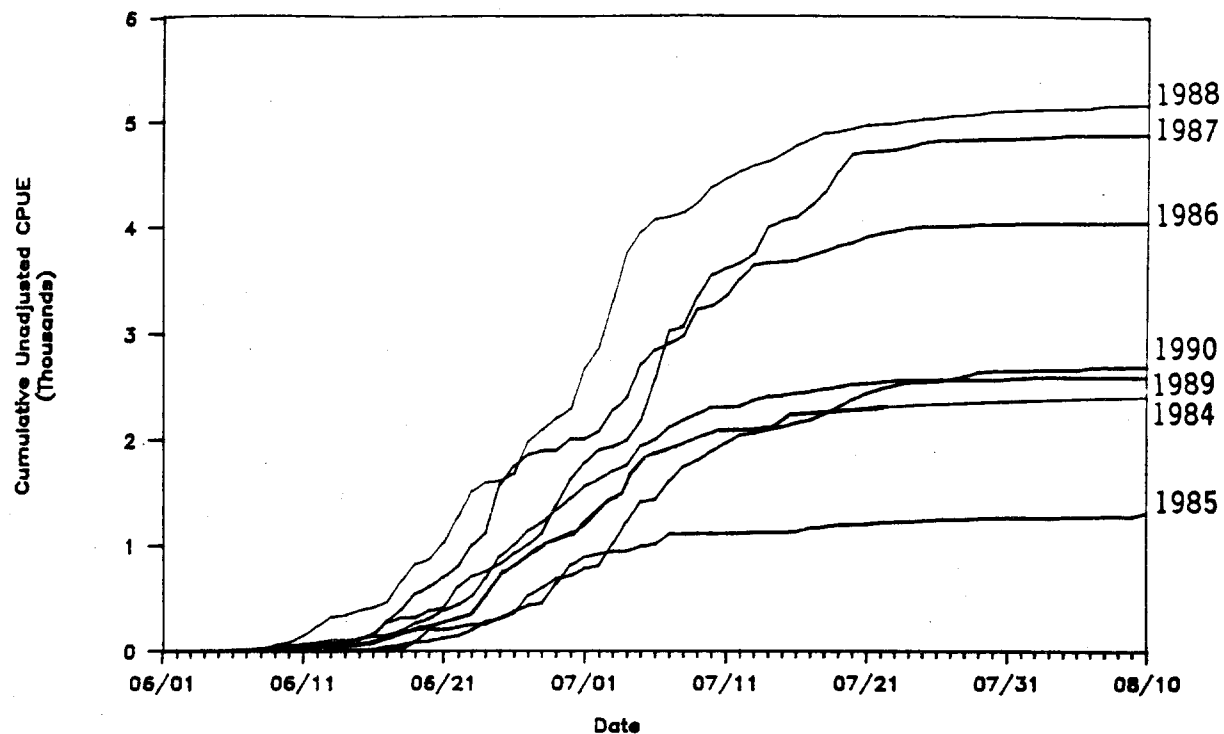


Figure 12. Cumulative unadjusted (top) and adjusted (bottom) mean tidal CPUE of chum salmon from the 1984 - 1990 Bethel test fishery. Adjusted CPUE was not calculated in 1989 because of assumption violations.

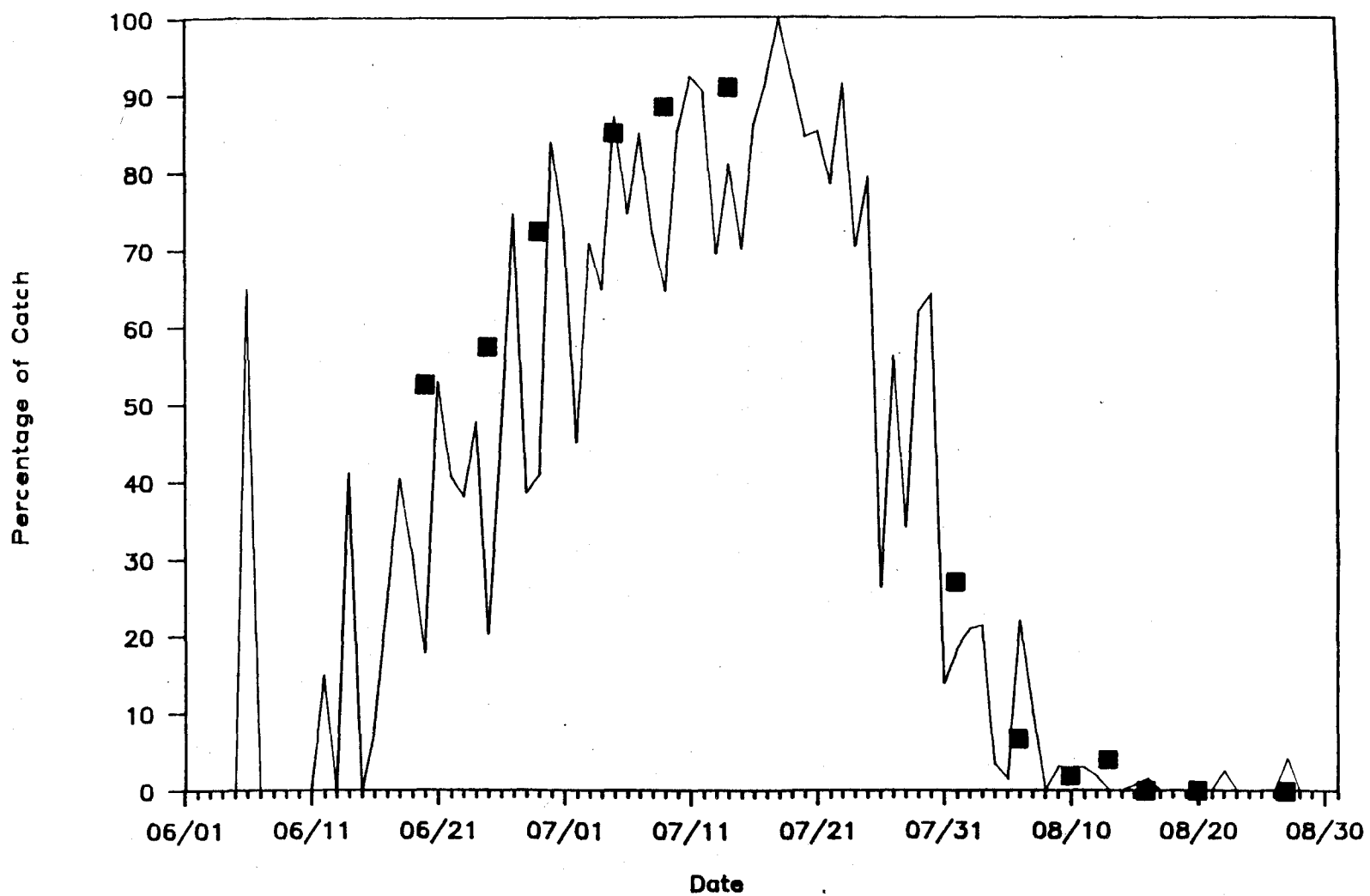


Figure 13. Proportion of chum salmon in the daily catches of the 1990 Bethel test fishery (line) and the District 1 commercial fishery (■).

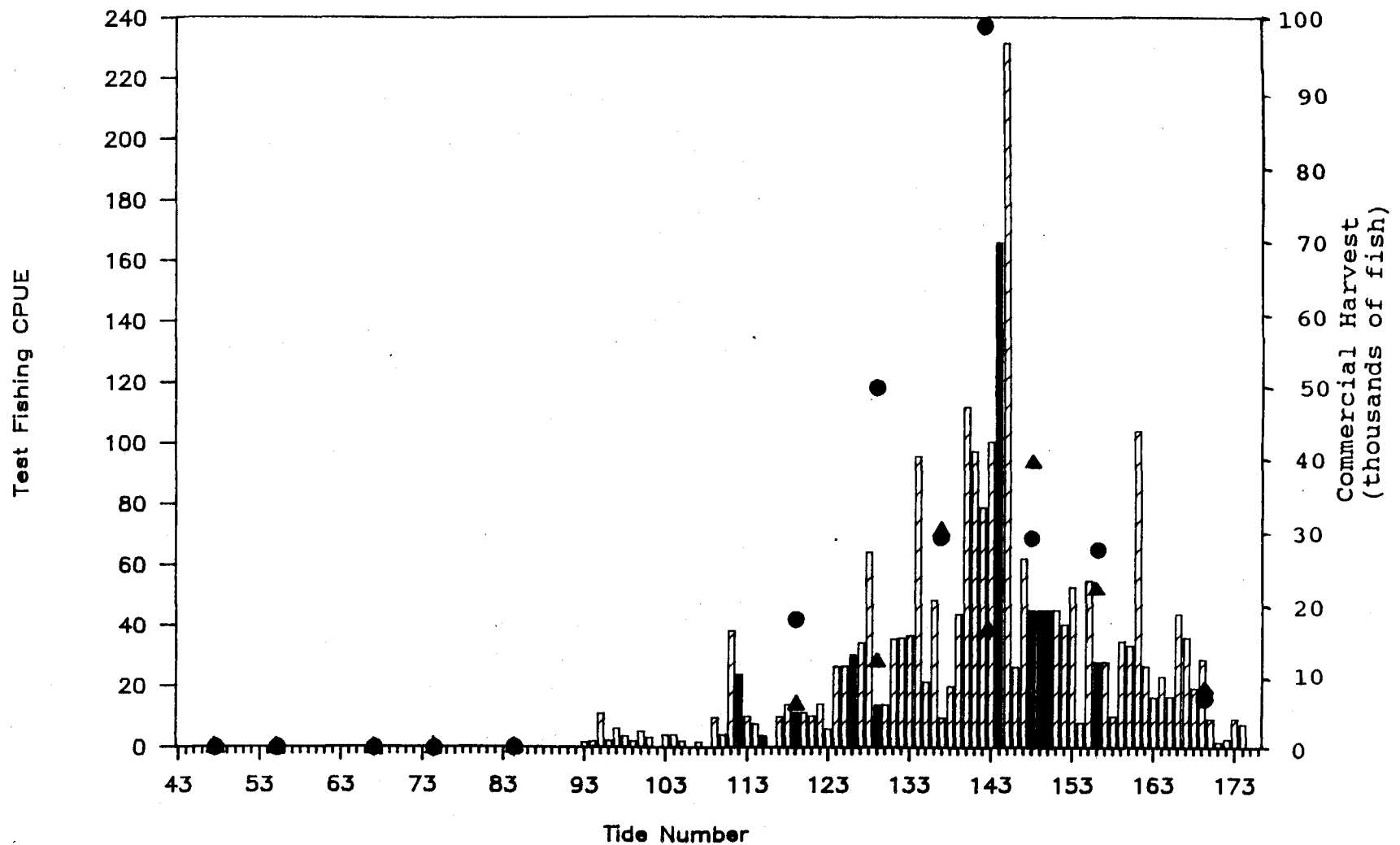


Figure 14. Comparison of the unadjusted 1990 mean tidal CPUE for coho salmon caught in the Bethel test fishery (bars) and the District 1 coho salmon commercial harvest, by period, and separated by catches made down stream (●) and up stream (▲) of the Bethel test fishery. Solid bars are used where CPUE was estimated.

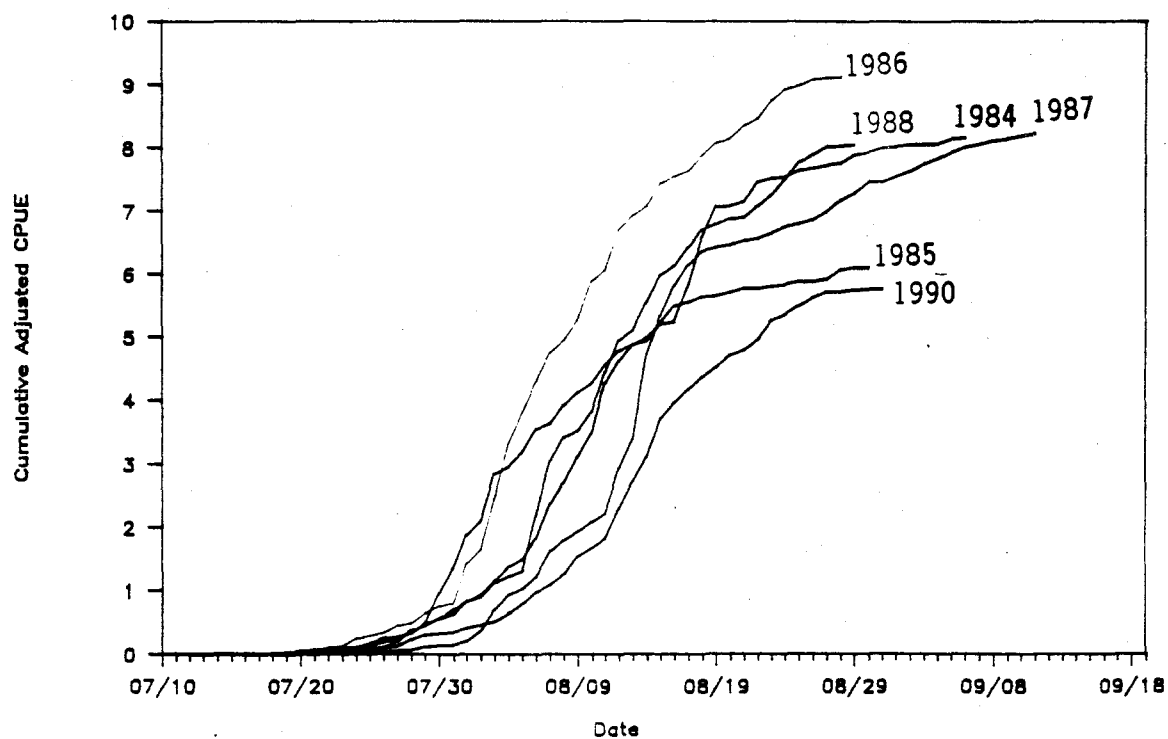
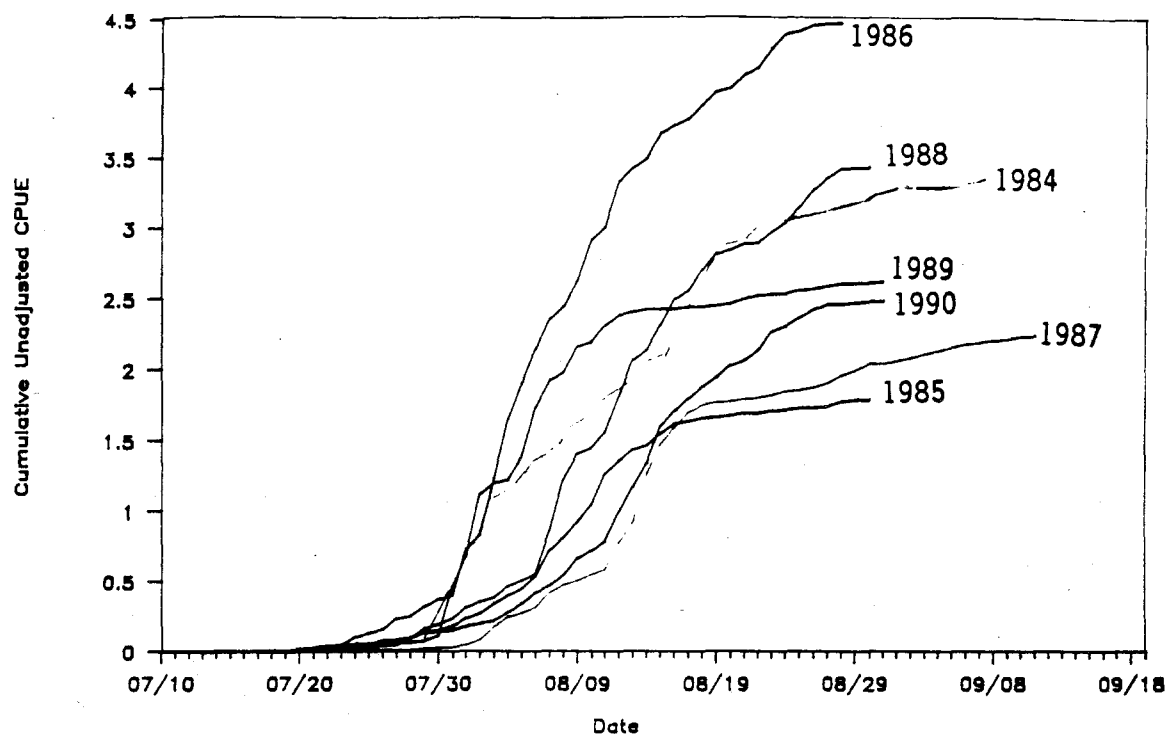


Figure 15. Cumulative unadjusted (top) and adjusted (bottom) mean tidal CPUE of coho salmon from the 1984 - 1990 Bethel test fishery.

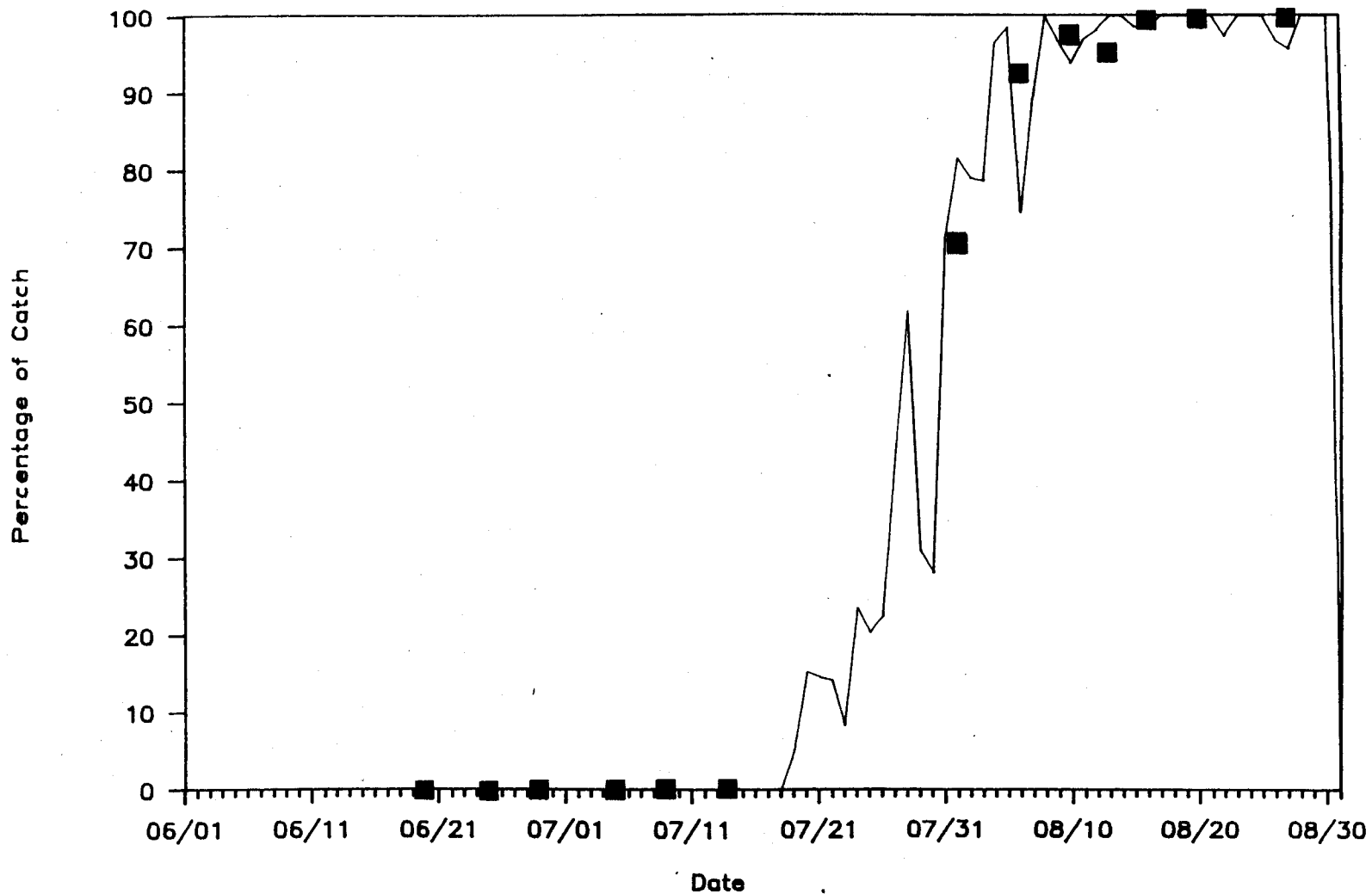


Figure 16. Proportion of coho salmon in the daily catches of the 1990 Bethel test fishery (line) and the District 1 commercial fishery (■).

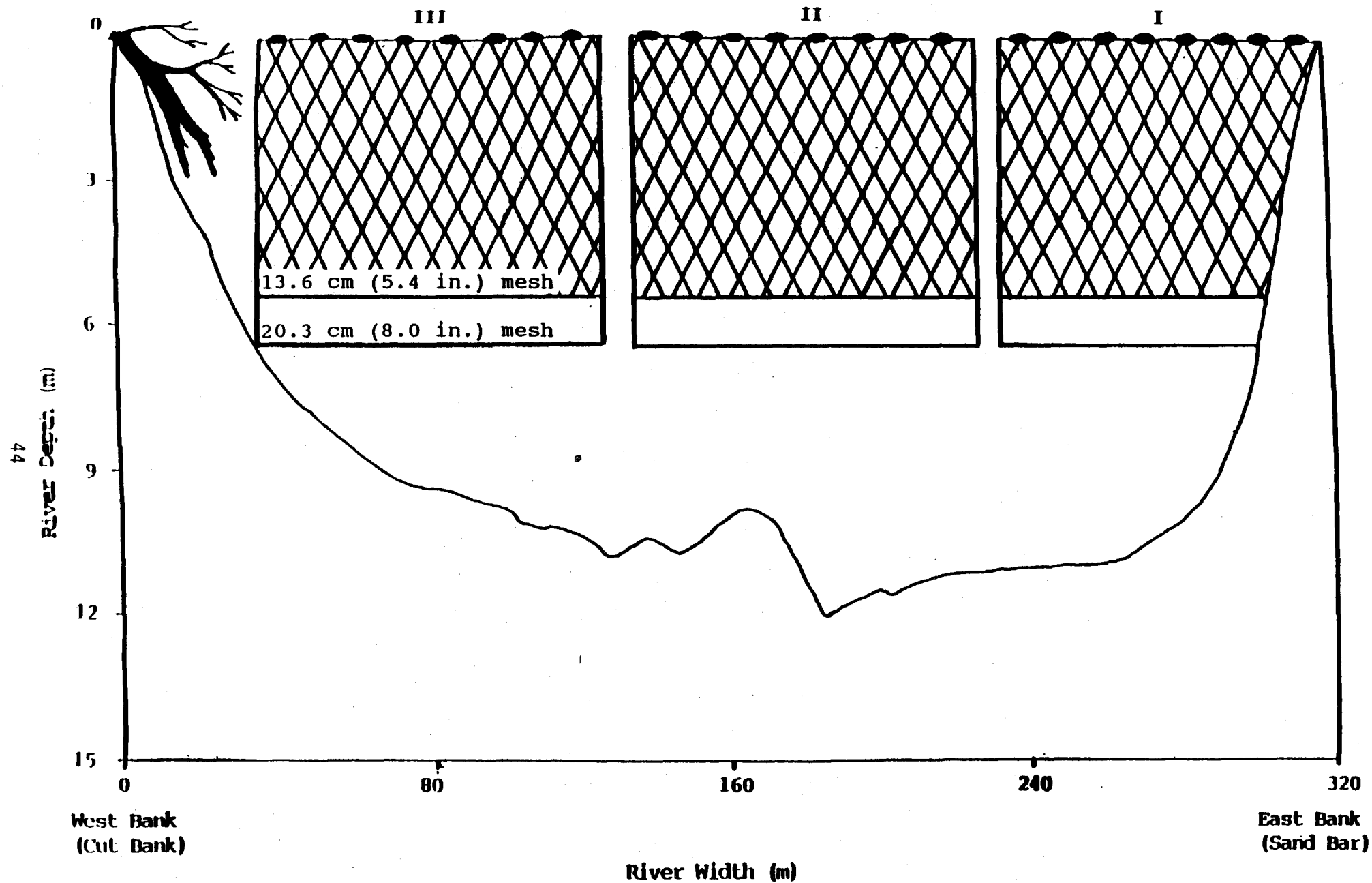


Figure 17. Profile of a cross-section of the Kuskokwim River approximately four miles upstream of Bethel as it appeared in 1990, and the area sampled by gill nets used in the Bethel test fishery (drawn to scale).

Appendix A. Memorandum concerning the elimination of the fourth gill net drift in the Bethel test fishery.

MEMORANDUM

STATE OF ALASKA
Department of Fish & Game

TO: Distribution

Date: 12 March 1990

File No.: pers\4thdrift.mem

Telephone No.: 543-2433

Subject: elimination of the

FROM: Doug Molyneaux
Kuskokwim Research Biologist
Commercial Fisheries Division
Bethel

4th coho drift in
Bethel test fishery

Current methodology employed in the Bethel test fishery incorporates four gill net drifts being conducted each high tide. These four drifts are distributed between three stations. The four drifts serve a distinct purpose when two different gill net mesh sizes are used; however, the technique is continued after 10 July when only one mesh size is used and the purpose of the fourth drift is lost. Furthermore, continuing the fourth drift after 10 July erodes the effectiveness of the test fish index and diminishes the efficiency of the program (see supplement for details). Fortunately coho are the only species substantially affected (Figure 1). I propose that after 10 July the fourth drift be eliminated to enhance the effectiveness and efficiency of the Bethel test fish program.

If the fourth drift is eliminated it will effect the comparability of future mean tidal CPUE data with historic data. The difference is relatively small, but enough to be of potential concern to management (Figure 2). This means that in order to maintain comparability between years the fourth drift will have to be eliminated from historic data. Eliminating the forth drift component from the unadjusted mean tidal CPUE should only require a few days of work, however updating the adjusted mean tidal CPUE would require a much more substantial effort in reconstructing the catchability adjustments. Fortunately, analysis of various in-season and post-season indexes of coho abundance in the Kuskokwim River from 1984 through 1989 suggest the unadjusted mean tidal CPUE is probably a better indicator of coho passage than the adjusted CPUE (Figure 3). In fact, conditions in 1989 prohibited a reliable calculation of adjusted coho CPUE. This being the case I further propose that, along with eliminating the fourth drift, calculation of the adjusted coho CPUE should also be eliminated. The time savings of eliminating the fourth drift can be redirected towards addressing other needs in the Kuskokwim Area such as investigating the depth distribution of coho at the Bethel test fish site and the ASL sampling program.

cc:

Buklis	Francisco
Burkey	Randall
Cannon	Wade

SUPPLEMENT

The effectiveness of the test fishery is compromised because the CPUE for the forth drift, which duplicates one of the other three stations on a random schedule, is nearly always smaller than the first drift for that station, plus the degree of difference varies with the station being duplicated (Table 1). The resulting mean tidal CPUE is artificially lowered in a manner that is not consistent.

Table 1. Comparison of average 1989 coho drift CPUE by station for duplicated drifts in the Bethel test fishery.

Station	First Drift	Second Drift
1	32.42	20.84
2	49.69	32.78
3	17.95	17.25

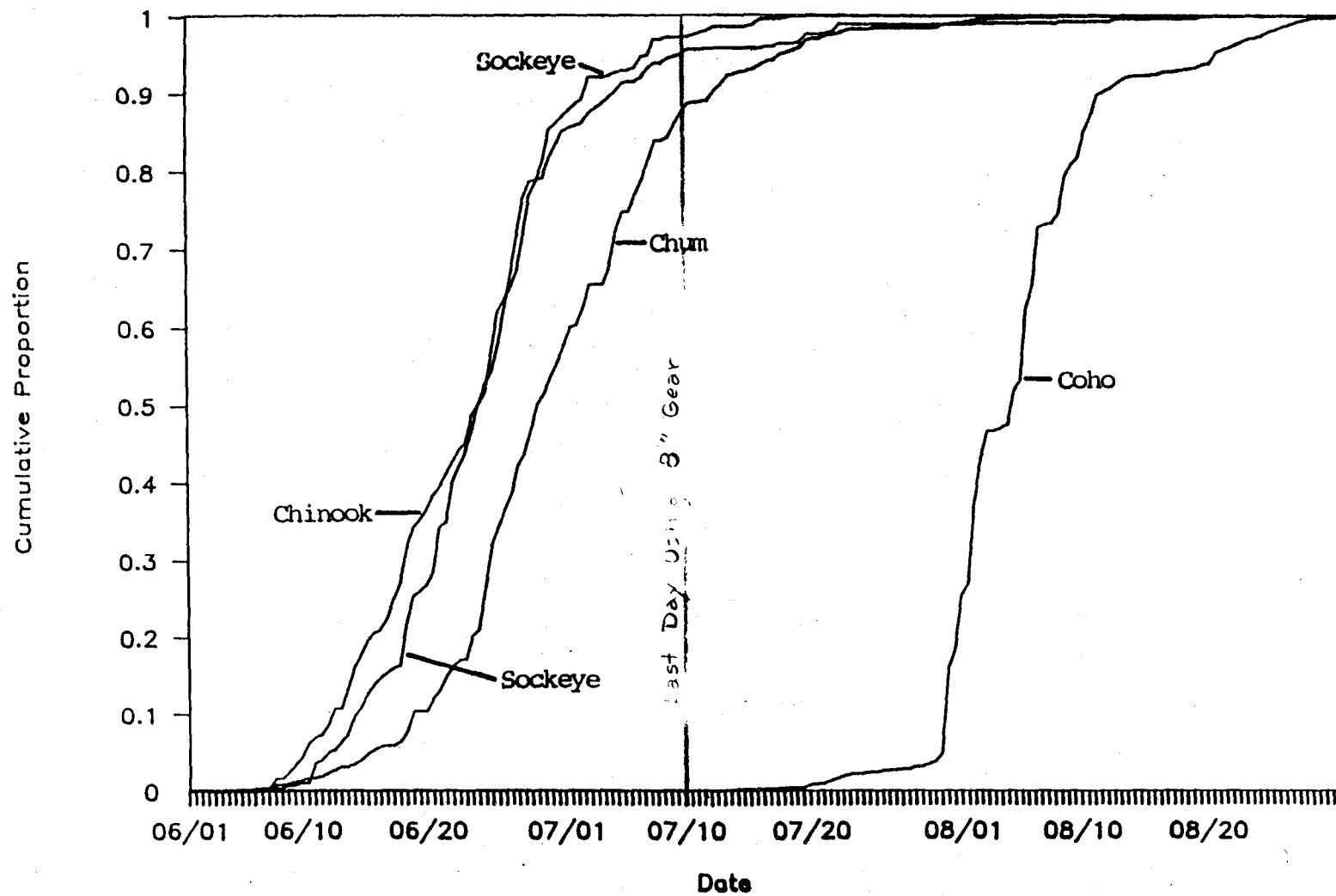


Figure 1. Cumulative proportions of mean tidal CPUE for salmon caught in the 1989 Bethel test fishery.

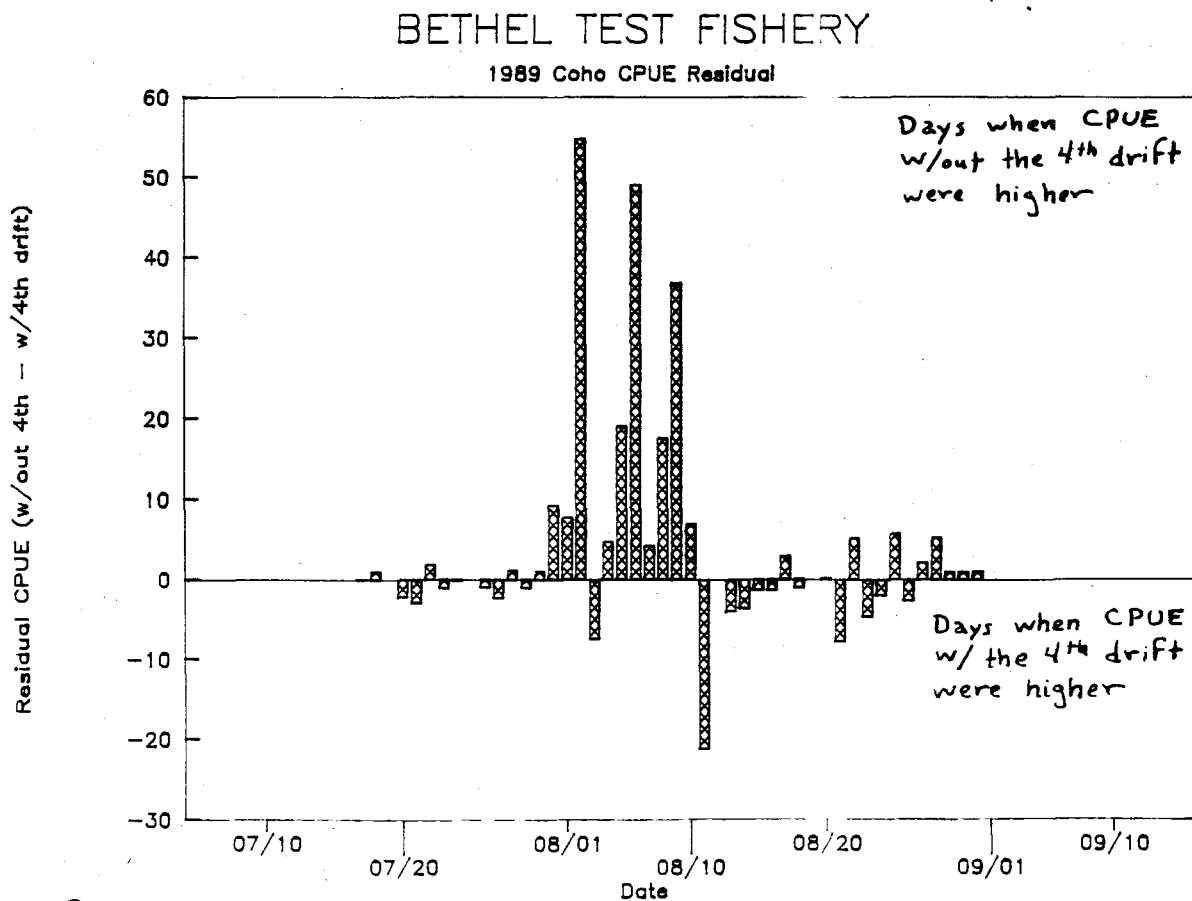
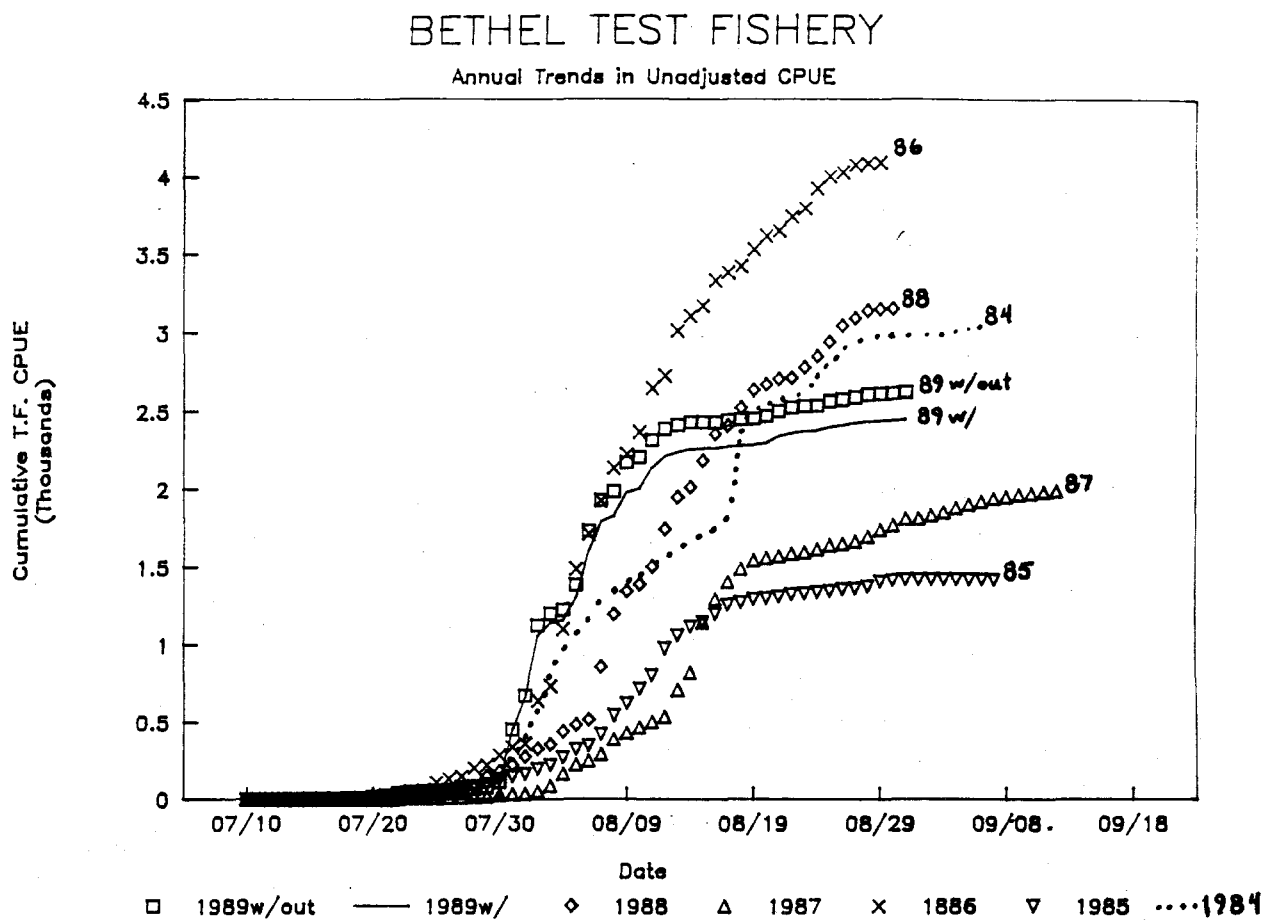


Figure 2.

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery.

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
06/01	1	1	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/01	1	2	2	50	5.4	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/01	1	3	2	50	8.0	23.5	0	0.0	0	0.0	0	0.0	0	0.0
06/01	1	4	1	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/02	2	5	3	50	8.0	22.0	0	0.0	0	0.0	0	0.0	0	0.0
06/02	2	6	2	50	5.4	21.5	1	5.6	0	0.0	0	0.0	0	0.0
06/02	2	7	1	50	5.4	22.0	0	0.0	0	0.0	0	0.0	0	0.0
06/02	2	8	1	50	8.0	22.0	0	0.0	0	0.0	0	0.0	0	0.0
06/02	3	NOT FISHED (WEEKEND)												
06/02	3													
06/02	3													
06/02	3													
06/03	4	9	3	50	8.0	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/03	4	10	2	50	8.0	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/03	4	11	2	50	5.4	22.0	0	0.0	0	0.0	0	0.0	0	0.0
06/03	4	12	1	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/03	5	NOT FISHED (WEEKEND)												
06/03	5													
06/03	5													
06/03	5													
06/04	6	13	3	50	8.0	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/04	6	14	3	50	5.4	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/04	6	15	2	50	5.4	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/04	6	16	1	50	8.0	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/04	7	NOT FISHED												
06/04	7													
06/04	7													
06/04	7													
06/05	8	17	3	50	5.4	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/05	8	18	2	50	8.0	22.0	0	0.0	0	0.0	0	0.0	0	0.0
06/05	8	19	1	50	8.0	21.5	1	5.6	0	0.0	0	0.0	0	0.0
06/05	8	20	1	50	5.4	22.0	0	0.0	0	0.0	0	0.0	0	0.0
06/05	9	21	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/05	9	22	3	50	8.0	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/05	9	23	2	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/05	9	24	1	50	5.4	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/06	10	25	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/06	10	26	2	50	5.4	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/06	10	27	2	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/06	10	28	1	50	8.0	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/06	11	29	3	50	8.0	20.5	1	5.9	0	0.0	0	0.0	0	0.0
06/06	11	30	2	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/06	11	31	1	50	5.4	22.0	0	0.0	0	0.0	1	5.5	0	0.0
06/06	11	32	1	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/07	12	33	3	50	8.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/07	12	34	2	50	8.0	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/07	12	35	2	50	5.4	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/07	12	36	1	50	5.4	22.0	2	10.9	0	0.0	0	0.0	0	0.0
06/07	13	37	3	50	8.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/07	13	38	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/07	13	39	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/07	13	40	1	50	8.0	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/08	14	41	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/08	14	42	2	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/08	14	43	1	50	8.0	20.5	1	5.9	0	0.0	0	0.0	0	0.0
06/08	14	44	1	50	5.4	21.5	2	11.2	0	0.0	0	0.0	0	0.0
06/08	15	45	3	50	5.4	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/08	15	46	3	50	8.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
06/08	15	47	2	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/08	15	48	1	50	5.4	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/09	16	49	3	50	5.4	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/09	16	50	2	50	5.4	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/09	16	51	2	50	8.0	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/09	16	52	1	50	8.0	22.0	1	5.5	0	0.0	0	0.0	0	0.0
06/09	17	NOT FISHED (MECHANICAL PROBLEMS WITH OUTBOARD MOTOR)												
06/09	17													
06/09	17													
06/09	17													
06/10	18	NOT FISHED (MECHANICAL PROBLEMS WITH OUTBOARD MOTOR)												
06/10	18													
06/10	18													
06/10	18													
06/10	19	53	3	50	8.0	21.0	1	5.7	0	0.0	0	0.0	0	0.0
06/10	19	54	2	50	5.4	20.5	1	5.9	0	0.0	0	0.0	0	0.0
06/10	19	55	1	50	5.4	14.5	1	8.3	0	0.0	0	0.0	0	0.0
06/10	19	56	1	50	8.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/11	20	57	3	50	8.0	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/11	20	58	2	50	8.0	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/11	20	59	2	50	5.4	21.0	2	11.4	0	0.0	0	0.0	0	0.0
06/11	20	60	1	50	5.4	22.5	4	21.3	2	10.7	0	0.0	0	0.0
06/11	21	61	3	50	8.0	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/11	21	62	3	50	5.4	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/11	21	63	2	50	5.4	21.0	2	11.4	1	5.7	0	0.0	0	0.0
06/11	21	64	1	50	8.0	21.0	2	11.4	0	0.0	0	0.0	0	0.0
06/12	22	65	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/12	22	66	2	50	8.0	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/12	22	67	1	50	8.0	18.0	3	20.0	0	0.0	0	0.0	0	0.0
06/12	22	68	1	50	5.4	20.5	1	5.9	1	5.9	1	5.9	0	0.0
06/12	23	69	3	50	5.4	21.0	1	5.7	0	0.0	0	0.0	0	0.0
06/12	23	70	3	50	8.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/12	23	71	2	50	8.0	21.0	1	5.7	0	0.0	0	0.0	0	0.0
06/12	23	72	1	50	5.4	21.0	3	17.1	0	0.0	0	0.0	0	0.0
06/13	24	73	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/13	24	74	2	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/13	24	75	2	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/13	24	76	1	50	8.0	21.5	3	16.7	0	0.0	0	0.0	0	0.0
06/13	25	77	3	50	8.0	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/13	25	78	2	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/13	25	79	2	50	5.4	20.5	1	5.9	0	0.0	0	0.0	0	0.0
06/13	25	80	1	50	5.4	18.5	0	0.0	0	0.0	0	0.0	0	0.0
06/14	26	81	3	50	8.0	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/14	26	82	2	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/14	26	83	2	50	5.4	21.0	0	0.0	2	11.4	1	5.7	0	0.0
06/14	26	84	1	50	5.4	18.5	0	0.0	0	0.0	0	0.0	0	0.0
06/14	27	85	3	50	8.0	21.5	0	0.0	0	0.0	0	0.0	0	0.0
06/14	27	86	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/14	27	87	2	50	5.4	24.5	2	9.8	4	19.6	4	19.6	0	0.0
06/14	27	88	1	50	8.0	23.5	0	0.0	0	0.0	0	0.0	0	0.0
06/15	28	89	3	50	5.4	20.5	1	5.9	1	5.9	0	0.0	0	0.0
06/15	28	90	2	50	8.0	22.0	1	5.5	0	0.0	0	0.0	0	0.0
06/15	28	91	1	50	8.0	20.5	3	17.6	1	5.9	0	0.0	0	0.0
06/15	28	92	1	50	5.4	21.5	1	5.6	4	22.3	0	0.0	0	0.0
06/16	29	93	3	50	5.4	21.0	0	0.0	0	0.0	0	0.0	0	0.0
06/16	29	94	3	50	8.0	18.0	0	0.0	0	0.0	0	0.0	0	0.0
06/16	29	95	2	50	8.0	18.5	1	6.5	0	0.0	0	0.0	0	0.0
06/16	29	96	1	50	5.4	21.5	3	16.7	7	39.1	1	5.6	0	0.0

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
06/16	30	97	3	50	5.4	21.5	1	5.6	0	0.0	0	0.0	0	0.0
06/16	30	98	2	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/16	30	99	2	50	8.0	21.5	2	11.2	0	0.0	0	0.0	0	0.0
06/16	30	100	1	50	8.0	20.5	1	5.9	0	0.0	0	0.0	0	0.0
06/17	31	101	3	50	8.0	19.0	0	0.0	0	0.0	0	0.0	0	0.0
06/17	31	102	2	50	5.4	20.5	0	0.0	2	11.7	0	0.0	0	0.0
06/17	31	103	1	50	5.4	20.0	1	6.0	3	18.0	0	0.0	0	0.0
06/17	31	104	1	50	8.0	18.0	0	0.0	0	0.0	0	0.0	0	0.0
06/17	32	105	3	50	8.0	21.0	1	5.7	0	0.0	0	0.0	0	0.0
06/17	32	106	2	50	8.0	19.0	0	0.0	1	6.3	0	0.0	0	0.0
06/17	32	107	2	50	5.4	18.5	1	6.5	6	38.9	3	19.5	0	0.0
06/17	32	108	1	50	5.4	19.0	1	6.3	9	56.8	4	25.3	0	0.0
06/18	33	109	3	50	8.0	21.0	0	0.0	1	5.7	0	0.0	0	0.0
06/18	33	110	3	50	5.4	20.5	1	5.9	0	0.0	3	17.6	0	0.0
06/18	33	111	2	50	5.4	20.5	1	5.9	0	0.0	1	5.9	0	0.0
06/18	33	112	1	50	8.0	20.0	1	6.0	0	0.0	1	6.0	0	0.0
06/18	34	113	3	50	5.4	21.0	1	5.7	2	11.4	1	5.7	0	0.0
06/18	34	114	2	50	8.0	19.0	1	6.3	0	0.0	0	0.0	0	0.0
06/18	34	115	1	50	8.0	21.0	3	17.1	0	0.0	2	11.4	0	0.0
06/18	34	116	1	50	5.4	24.0	1	5.0	4	20.0	2	10.0	0	0.0
06/19	35	117	3	50	5.4	19.5	3	18.5	1	6.2	0	0.0	0	0.0
06/19	35	118	3	50	8.0	20.0	0	0.0	1	6.0	0	0.0	0	0.0
06/19	35	119	2	50	8.0	21.5	5	27.9	1	5.6	2	11.2	0	0.0
06/19	35	120	1	50	5.4	17.5	0	0.0	1	6.9	2	13.7	0	0.0
06/19	36	121	3	50	5.4	22.5	1	5.3	1	5.3	1	5.3	0	0.0
06/19	36	122	2	50	5.4	23.0	3	15.7	11	57.4	7	36.5	0	0.0
06/19	36	123	2	50	8.0	19.5	1	6.2	0	0.0	2	12.3	0	0.0
06/19	36	124	1	50	8.0	20.5	5	29.3	0	0.0	1	5.9	0	0.0
06/20	37	125	3	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/20	37	126	2	50	5.4	22.0	0	0.0	7	38.2	1	5.5	0	0.0
06/20	37	127	1	50	5.4	20.5	4	23.4	2	11.7	1	5.9	0	0.0
06/20	37	128	1	50	8.0	19.0	1	6.3	0	0.0	0	0.0	0	0.0
06/20	38	NOT FISHED (COMMERCIAL OPENING)												
06/20	38													
06/20	38													
06/21	39	129	3	50	8.0	19.0	0	0.0	0	0.0	0	0.0	0	0.0
06/21	39	130	2	50	8.0	19.5	0	0.0	0	0.0	1	6.2	0	0.0
06/21	39	131	2	50	5.4	20.0	0	0.0	1	6.0	1	6.0	0	0.0
06/21	39	132	1	50	5.4	21.0	1	5.7	1	5.7	0	0.0	0	0.0
06/21	40	133	3	50	8.0	21.5	4	22.3	0	0.0	0	0.0	0	0.0
06/21	40	134	3	50	5.4	19.5	1	6.2	1	6.2	0	0.0	0	0.0
06/21	40	135	2	50	5.4	20.0	2	12.0	2	12.0	9	54.0	0	0.0
06/21	40	136	1	50	8.0	21.5	0	0.0	0	0.0	1	5.6	0	0.0
06/22	41	137	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
06/22	41	138	2	50	8.0	21.0	2	11.4	0	0.0	0	0.0	0	0.0
06/22	41	139	1	50	8.0	20.0	2	12.0	0	0.0	0	0.0	0	0.0
06/22	41	140	1	50	5.4	22.0	2	10.9	3	16.4	2	10.9	0	0.0
06/22	42	141	3	50	5.4	21.0	2	11.4	2	11.4	3	17.1	0	0.0
06/22	42	142	3	50	8.0	19.5	1	6.2	0	0.0	0	0.0	0	0.0
06/22	42	143	2	50	8.0	20.5	2	11.7	0	0.0	1	5.9	0	0.0
06/22	42	144	1	50	5.4	21.5	2	11.2	0	0.0	3	16.7	0	0.0
06/23	43	145	3	50	5.4	19.5	1	6.2	1	6.2	0	0.0	0	0.0
06/23	43	146	2	50	5.4	25.0	1	4.8	19	91.2	4	19.2	0	0.0
06/23	43	147	2	50	8.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0
06/23	43	148	1	50	8.0	18.5	0	0.0	0	0.0	1	6.5	0	0.0
06/23	44	149	3	50	8.0	21.0	1	5.7	0	0.0	0	0.0	0	0.0
06/23	44	150	2	50	5.4	23.0	1	5.2	4	20.9	4	20.9	0	0.0
06/23	44	151	1	50	5.4	23.5	3	15.3	7	35.7	13	66.4	0	0.0

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
06/23	44	152	1	50	8.0	19.5	0	0.0	0	0.0	2	12.3	0	0.0
06/24	45	153	3	50	8.0	20.5	0	0.0	0	0.0	0	0.0	0	0.0
06/24	45	154	2	50	8.0	20.5	1	5.9	1	5.9	3	17.6	0	0.0
06/24	45	155	2	50	5.4	22.0	0	0.0	10	54.5	16	87.3	0	0.0
06/24	45	156	1	50	5.4	21.0	0	0.0	8	45.7	9	51.4	0	0.0
06/24	46	157	3	50	8.0	22.5	4	21.3	0	0.0	1	5.3	0	0.0
06/24	46	158	3	50	5.4	19.5	1	6.2	0	0.0	0	0.0	0	0.0
06/24	46	159	2	50	5.4	23.5	1	5.1	4	20.4	3	15.3	0	0.0
06/24	46	160	1	50	8.0	21.5	5	27.9	2	11.2	2	11.2	0	0.0
06/25	47	161	3	50	5.4	24.0	6	30.0	12	60.0	3	15.0	0	0.0
06/25	47	162	2	50	8.0	20.5	5	29.3	0	0.0	2	11.7	0	0.0
06/25	47	163	1	50	8.0	20.5	7	41.0	4	23.4	0	0.0	0	0.0
06/25	47	164	1	50	5.4	19.0	0	0.0	5	31.6	2	12.6	0	0.0
06/25	48	165	3	50	8.0	20.5	1	5.9	0	0.0	0	0.0	0	0.0
06/25	48	166	3	50	5.4	19.0	1	6.3	4	25.3	2	12.6	0	0.0
06/25	48	167	2	50	8.0	18.5	1	6.5	1	6.5	1	6.5	0	0.0
06/25	48	168	1	50	5.4	20.5	3	17.6	11	64.4	4	23.4	0	0.0
06/26	49	169	3	50	5.4	17.0	0	0.0	0	0.0	0	0.0	0	0.0
06/26	49	170	2	50	5.4	19.5	3	18.5	1	6.2	8	49.2	0	0.0
06/26	49	171	2	50	8.0	18.5	2	13.0	0	0.0	1	6.5	0	0.0
06/26	49	172	1	50	8.0	26.5	12	54.3	0	0.0	2	9.1	0	0.0
06/26	50	173	3	50	8.0	20.5	4	23.4	0	0.0	3	17.6	0	0.0
06/26	50	174	2	50	5.4	20.5	0	0.0	4	23.4	5	29.3	0	0.0
06/26	50	175	1	50	5.4	18.5	0	0.0	3	19.5	3	19.5	0	0.0
06/26	50	176	1	50	8.0	17.5	2	13.7	0	0.0	0	0.0	0	0.0
06/27	51	177	3	50	8.0	20.0	4	24.0	0	0.0	0	0.0	0	0.0
06/27	51	178	2	50	8.0	19.5	2	12.3	0	0.0	2	12.3	0	0.0
06/27	51	179	2	50	5.4	24.5	1	4.9	8	39.2	34	166.5	0	0.0
06/27	51	180	1	50	5.4	23.5	0	0.0	4	20.4	17	86.8	0	0.0
06/27	52	181	3	50	8.0	17.5	1	6.9	0	0.0	0	0.0	0	0.0
06/27	52	182	3	50	5.4	19.5	0	0.0	0	0.0	2	12.3	0	0.0
06/27	52	183	2	50	5.4	22.0	1	5.5	5	27.3	13	70.9	0	0.0
06/27	52	184	1	50	8.0	18.5	0	0.0	0	0.0	0	0.0	0	0.0
06/28	53	185	3	50	5.4	23.0	4	20.9	11	57.4	4	20.9	0	0.0
06/28	53	186	2	50	8.0	17.5	0	0.0	0	0.0	0	0.0	0	0.0
06/28	53	187	1	50	8.0	22.0	4	21.8	3	16.4	1	5.5	0	0.0
06/28	53	188	1	50	5.4	17.5	2	13.7	3	20.6	2	13.7	0	0.0
06/28	54	189	3	50	5.4	21.0	1	5.7	1	5.7	4	22.9	0	0.0
06/28	54	190	3	50	8.0	18.5	1	6.5	0	0.0	0	0.0	0	0.0
06/28	54	191	2	50	8.0	19.0	1	6.3	0	0.0	6	37.9	0	0.0
06/28	54	192	1	50	5.4	25.0	5	24.0	20	96.0	18	86.4	0	0.0
06/29	55	193	1	50	5.4	20.0	1	6.0	17	102.0	15	90.0	0	0.0
06/29	55	194	2	50	5.4	12.0	0	0.0	2	20.0	3	30.0	0	0.0
06/29	55	195	2	50	8.0	10.0	0	0.0	1	12.0	0	0.0	0	0.0
06/29	55	196	3	50	8.0	6.0	2	40.0	0	0.0	2	40.0	0	0.0
06/29	56	197	3	50	5.4	20.0	1	6.0	8	48.0	1	6.0	0	0.0
06/29	56	198	2	50	5.4	22.5	1	5.3	7	37.3	9	48.0	0	0.0
06/29	56	199	2	50	8.0	21.5	2	11.2	0	0.0	2	11.2	0	0.0
06/29	56	200	1	50	8.0	21.0	3	17.1	0	0.0	0	0.0	0	0.0
06/30	57	201	3	50	8.0	22.0	0	0.0	0	0.0	0	0.0	0	0.0
06/30	57	202	2	50	5.4	20.0	0	0.0	2	12.0	8	48.0	0	0.0
06/30	57	203	1	50	5.4	15.5	0	0.0	0	0.0	2	15.5	0	0.0
06/30	57	SNAG (MISSED ONE 8.0" DRIFT)												
07/01	58	204	3	50	8.0	18.0	0	0.0	0	0.0	2	13.3	0	0.0
07/01	58	205	2	50	8.0	18.5	0	0.0	0	0.0	0	0.0	0	0.0
07/01	58	206	2	50	5.4	18.5	0	0.0	1	6.5	1	6.5	0	0.0
07/01	58	207	1	50	5.4	21.0	0	0.0	4	22.9	5	28.6	0	0.0
07/01	59	208	3	50	8.0	17.5	0	0.0	0	0.0	0	0.0	0	0.0

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
07/01	59	209	3	50	5.4	17.5	0	0.0	0	0.0	2	13.7	0	0.0
07/01	59	210	2	50	5.4	19.5	1	6.2	3	18.5	14	86.2	0	0.0
07/01	59	211	1	50	8.0	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/02	60	212	3	50	5.4	18.5	1	6.5	1	6.5	3	19.5	0	0.0
07/02	60	213	2	50	8.0	19.5	0	0.0	0	0.0	4	24.6	0	0.0
07/02	60	214	1	50	8.0	18.5	0	0.0	0	0.0	4	25.9	0	0.0
07/02	60	215	1	50	5.4	19.0	0	0.0	0	0.0	1	6.3	0	0.0
07/02	61	216	3	50	5.4	18.0	2	13.3	1	6.7	0	0.0	0	0.0
07/02	61	217	3	50	8.0	19.5	1	6.2	0	0.0	0	0.0	0	0.0
07/02	61	218	2	50	8.0	20.5	2	11.7	0	0.0	1	5.9	0	0.0
07/02	61	219	1	50	5.4	20.5	0	0.0	6	35.1	5	29.3	0	0.0
07/03	62	220	3	50	5.4	18.0	0	0.0	1	6.7	0	0.0	0	0.0
07/03	62	221	2	50	5.4	34.5	3	10.4	22	76.5	78	271.3	0	0.0
07/03	62	222	2	50	8.0	22.0	5	27.3	2	10.9	0	0.0	0	0.0
07/03	62	223	1	50	8.0	17.5	1	6.9	0	0.0	2	13.7	0	0.0
07/03	63	224	3	50	8.0	17.5	0	0.0	0	0.0	0	0.0	0	0.0
07/03	63	225	2	50	5.4	19.0	1	6.3	2	12.6	6	37.9	0	0.0
07/03	63	226	1	50	5.4	21.0	3	17.1	6	34.3	16	91.4	0	0.0
07/03	63	227	1	50	8.0	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/04	64	228	3	50	8.0	18.0	1	6.7	1	6.7	0	0.0	0	0.0
07/04	64	229	2	50	8.0	20.5	4	23.4	5	29.3	8	46.8	0	0.0
07/04	64	230	2	50	5.4	22.5	1	5.3	10	53.3	16	85.3	0	0.0
07/04	64	231	1	50	5.4	22.0	4	21.8	11	60.0	16	87.3	0	0.0
07/04	65	NOT FISHED (HOLIDAY)												
07/04	65													
07/04	65													
07/04	65													
07/05	66	232	3	50	8.0	18.0	0	0.0	0	0.0	0	0.0	0	0.0
07/05	66	233	3	50	5.4	18.5	0	0.0	0	0.0	2	13.0	0	0.0
07/05	66	234	2	50	5.4	30.0	1	4.0	11	44.0	81	324.0	0	0.0
07/05	66	235	1	50	8.0	17.0	0	0.0	1	7.1	0	0.0	0	0.0
07/05	67	NOT FISHED (COMMERCIAL FISHING PERIOD)												
07/05	67													
07/05	67													
07/05	67													
07/06	68	236	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
07/06	68	237	2	50	8.0	20.5	3	17.6	0	0.0	0	0.0	0	0.0
07/06	68	238	1	50	8.0	19.5	0	0.0	0	0.0	1	6.2	0	0.0
07/06	68	239	1	50	5.4	21.5	0	0.0	0	0.0	7	39.1	0	0.0
07/06	69	240	3	50	5.4	18.0	0	0.0	0	0.0	1	6.7	0	0.0
07/06	69	241	3	50	8.0	22.0	1	5.5	0	0.0	0	0.0	0	0.0
07/06	69	242	2	50	8.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0
07/06	69	243	1	50	5.4	20.0	0	0.0	1	6.0	1	6.0	0	0.0
07/07	70	244	3	50	5.4	18.0	0	0.0	0	0.0	0	0.0	0	0.0
07/07	70	245	2	50	5.4	27.0	3	13.3	9	40.0	72	320.0	0	0.0
07/07	70	246	2	50	8.0	18.5	0	0.0	0	0.0	1	6.5	0	0.0
07/07	70	247	1	50	8.0	20.0	1	6.0	0	0.0	1	6.0	0	0.0
07/07	71	248	3	50	8.0	20.5	1	5.9	0	0.0	0	0.0	0	0.0
07/07	71	249	2	50	5.4	18.0	0	0.0	0	0.0	4	26.7	0	0.0
07/07	71	250	1	50	5.4	22.5	1	5.3	1	5.3	0	0.0	0	0.0
07/07	71	251	1	50	8.0	21.0	0	0.0	0	0.0	0	0.0	0	0.0
07/08	72	252	3	50	8.0	19.0	1	6.3	0	0.0	0	0.0	0	0.0
07/08	72	253	2	50	8.0	22.0	5	27.3	0	0.0	9	49.1	0	0.0
07/08	72	254	2	50	5.4	30.0	0	0.0	11	44.0	27	108.0	0	0.0
07/08	72	255	1	50	5.4	22.0	0	0.0	6	32.7	18	98.2	0	0.0
07/08	73	256	3	50	8.0	19.5	0	0.0	0	0.0	2	12.3	0	0.0
07/08	73	257	3	50	5.4	17.5	1	6.9	0	0.0	2	13.7	0	0.0
07/08	73	258	2	50	5.4	21.0	0	0.0	0	0.0	9	51.4	0	0.0

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
07/08	73	259	1	50	8.0	20.0	4	24.0	0	0.0	1	6.0	0	0.0
07/09	74	260	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
07/09	74	261	2	50	8.0	20.0	0	0.0	0	0.0	3	18.0	0	0.0
07/09	74	262	1	50	8.0	20.5	1	5.9	0	0.0	4	23.4	0	0.0
07/09	74	263	1	50	5.4	21.0	0	0.0	10	57.1	17	97.1	0	0.0
07/09	75	264	3	50	5.4	20.0	0	0.0	0	0.0	3	18.0	0	0.0
07/09	75	265	3	50	8.0	19.5	1	6.2	1	6.2	1	6.2	0	0.0
07/09	75	266	2	50	8.0	24.5	0	0.0	0	0.0	0	0.0	0	0.0
07/09	75	267	1	50	5.4	17.5	1	6.9	0	0.0	1	6.9	0	0.0
07/10	76	268	3	50	5.4	20.0	0	0.0	0	0.0	1	6.0	0	0.0
07/10	76	269	2	50	5.4	23.5	0	0.0	3	15.3	13	66.4	0	0.0
07/10	76	270	2	50	8.0	17.5	0	0.0	0	0.0	0	0.0	0	0.0
07/10	76	271	1	50	8.0	18.0	0	0.0	0	0.0	1	6.7	0	0.0
07/10	77	272	3	50	8.0	19.0	0	0.0	0	0.0	1	6.3	0	0.0
07/10	77	273	2	50	5.4	18.0	0	0.0	0	0.0	6	40.0	0	0.0
07/10	77	274	1	50	5.4	19.0	0	0.0	2	12.6	8	50.5	0	0.0
07/10	77	275	1	50	8.0	17.5	0	0.0	0	0.0	0	0.0	0	0.0
07/11	78	276	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	ERR
07/11	78	277	2	50	5.4	25.0	0	0.0	4	19.2	22	105.6	0	ERR
07/11	78	278	1	50	5.4	20.5	0	0.0	0	0.0	5	29.3	0	0.0
07/11	79	279	3	50	5.4	19.0	0	0.0	0	0.0	3	18.9	0	0.0
07/11	79	280	2	50	5.4	20.0	0	0.0	0	0.0	6	36.0	0	0.0
07/11	79	281	1	50	5.4	20.0	0	0.0	0	0.0	6	36.0	0	0.0
07/12	80	282	3	50	5.4	19.0	0	0.0	1	6.3	0	0.0	0	0.0
07/12	80	283	2	50	5.4	23.0	0	0.0	0	0.0	24	125.2	0	0.0
07/12	80	284	1	50	5.4	19.5	0	0.0	0	0.0	2	12.3	0	0.0
07/12	81	285	3	50	5.4	20.0	1	6.0	0	0.0	3	18.0	0	0.0
07/12	81	286	2	50	5.4	20.0	0	0.0	0	0.0	8	48.0	0	0.0
07/12	81	287	1	50	5.4	21.0	1	5.7	1	5.7	3	17.1	0	0.0
07/13	82	288	3	50	5.4	19.5	0	0.0	1	6.2	0	0.0	0	0.0
07/13	82	289	2	50	5.4	22.0	0	0.0	1	5.5	8	43.6	0	0.0
07/13	82	290	1	50	5.4	19.5	0	0.0	1	6.2	1	6.2	0	0.0
07/13	83	291	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/13	83	292	2	50	5.4	19.5	0	0.0	1	6.2	3	18.5	0	0.0
07/13	83	293	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
07/14	84	294	3	50	5.4	17.0	0	0.0	1	7.1	0	0.0	0	0.0
07/14	84	295	2	50	5.4	15.0	0	0.0	0	0.0	0	0.0	0	0.0
07/14	84	296	1	50	5.4	12.0	0	0.0	1	10.0	0	0.0	0	0.0
07/14	85	267	3	50	5.4	19.5	1	6.2	0	0.0	0	0.0	0	0.0
07/14	85	298	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
07/14	85	299	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/15	86	300	3	50	5.4	19.0	1	6.3	1	6.3	0	0.0	0	0.0
07/15	86	301	2	50	5.4	19.5	0	0.0	0	0.0	3	18.5	0	0.0
07/15	86	302	1	50	5.4	20.0	0	0.0	1	6.0	2	12.0	0	0.0
07/15	87	303	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/15	87	304	2	50	5.4	20.5	0	0.0	1	5.9	6	35.1	0	0.0
07/15	87	305	1	50	5.4	19.5	0	0.0	1	6.2	1	6.2	0	0.0
07/16	88	306	3	50	5.4	19.5	0	0.0	1	6.2	0	0.0	0	0.0
07/16	88	307	2	50	5.4	19.5	0	0.0	0	0.0	2	12.3	0	0.0
07/16	88	308	1	50	5.4	19.5	0	0.0	1	6.2	0	0.0	0	0.0
07/16	89	309	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/16	89	310	2	50	5.4	22.0	1	5.5	0	0.0	17	92.7	0	0.0
07/16	89	311	1	50	5.4	17.0	0	0.0	0	0.0	1	7.1	0	0.0
07/17	90	312	3	50	5.4	19.5	1	6.2	0	0.0	3	18.5	0	0.0
07/17	90	313	2	50	5.4	19.5	0	0.0	0	0.0	3	18.5	0	0.0
07/17	90	314	1	50	5.4	20.0	0	0.0	0	0.0	6	36.0	0	0.0
07/18	91	315	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
07/18	91	316	2	50	5.4	22.0	0	0.0	0	0.0	14	76.4	0	0.0

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
07/18	91	317	1	50	5.4	22.0	0	0.0	0	0.0	5	27.3	0	0.0
07/18	92	318	3	50	5.4	19.5	0	0.0	0	0.0	5	30.8	0	0.0
07/18	92	319	2	50	5.4	20.0	0	0.0	0	0.0	2	12.0	0	0.0
07/18	92	320	1	50	5.4	19.5	0	0.0	0	0.0	3	18.5	0	0.0
07/19	93	321	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
07/19	93	322	2	50	5.4	22.5	0	0.0	0	0.0	1	5.3	1	5.3
07/19	93	323	1	50	5.4	20.0	0	0.0	1	6.0	2	12.0	0	0.0
07/19	94	324	3	50	5.4	21.0	0	0.0	0	0.0	4	22.9	1	5.7
07/19	94	325	2	50	5.4	19.5	0	0.0	0	0.0	5	30.8	0	0.0
07/19	94	326	1	50	5.4	21.5	0	0.0	0	0.0	23	128.4	0	0.0
07/20	95	327	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
07/20	95	328	2	50	5.4	22.0	0	0.0	0	0.0	16	87.3	5	27.3
07/20	95	329	1	50	5.4	19.0	0	0.0	0	0.0	8	50.5	1	6.3
07/20	96	330	3	50	5.4	19.5	0	0.0	0	0.0	6	36.9	0	0.0
07/20	96	331	2	50	5.4	19.0	0	0.0	0	0.0	2	12.6	0	0.0
07/20	96	332	1	50	5.4	19.0	0	0.0	0	0.0	5	31.6	1	6.3
07/21	97	333	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
07/21	97	334	2	50	5.4	21.5	0	0.0	0	0.0	13	72.6	0	0.0
07/21	97	335	1	50	5.4	19.5	0	0.0	0	0.0	6	36.9	3	18.5
07/21	98	336	3	50	5.4	21.5	0	0.0	0	0.0	9	50.2	0	0.0
07/21	98	337	2	50	5.4	22.0	0	0.0	0	0.0	1	5.5	2	10.9
07/21	98	338	1	50	5.4	20.5	0	0.0	0	0.0	1	5.9	0	0.0
07/22	99	339	3	50	5.4	19.0	0	0.0	0	0.0	1	6.3	0	0.0
07/22	99	340	2	50	5.4	20.0	0	0.0	0	0.0	2	12.0	1	6.0
07/22	99	341	1	50	5.4	22.5	0	0.0	0	0.0	12	64.0	0	0.0
07/22	100	342	3	50	5.4	20.0	1	6.0	0	0.0	0	0.0	0	0.0
07/22	100	343	2	50	5.4	19.5	0	0.0	0	0.0	1	6.2	0	0.0
07/22	100	344	1	50	5.4	23.0	1	5.2	0	0.0	6	31.3	3	15.7
07/23	101	345	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
07/23	101	346	2	50	5.4	25.0	0	0.0	0	0.0	11	52.8	2	9.6
07/23	101	347	1	50	5.4	20.0	0	0.0	0	0.0	1	6.0	0	0.0
07/23	102	348	3	50	5.4	17.0	0	0.0	0	0.0	2	14.1	0	0.0
07/23	102	349	2	50	5.4	19.0	0	0.0	0	0.0	1	6.3	0	0.0
07/23	102	350	1	50	5.4	19.5	0	0.0	0	0.0	4	24.6	0	0.0
07/24	103	351	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/24	103	352	2	50	5.4	20.0	0	0.0	0	0.0	4	24.0	0	0.0
07/24	103	353	1	50	5.4	20.0	1	6.0	0	0.0	6	36.0	2	12.0
07/24	104	354	3	50	5.4	18.5	0	0.0	0	0.0	0	0.0	0	0.0
07/24	104	355	2	50	5.4	19.5	0	0.0	0	0.0	2	12.3	2	12.3
07/24	104	356	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/25	105	357	3	50	5.4	20.0	0	0.0	0	0.0	1	6.0	0	0.0
07/25	105	358	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	1	6.2
07/25	105	359	1	50	5.4	22.0	0	0.0	0	0.0	1	5.5	0	0.0
07/25	106	360	3	50	5.4	18.5	0	0.0	0	0.0	1	6.5	0	0.0
07/25	106	361	2	50	5.4	20.0	0	0.0	0	0.0	1	6.0	0	0.0
07/25	106	362	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/26	107	363	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
07/26	107	364	2	50	5.4	20.5	1	5.9	0	0.0	0	0.0	0	0.0
07/26	107	365	1	50	5.4	22.0	0	0.0	0	0.0	0	0.0	1	5.5
07/26	108	366	3	50	5.4	19.0	0	0.0	0	0.0	1	6.3	0	0.0
07/26	108	367	2	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/26	108	368	1	50	5.4	19.0	1	6.3	0	0.0	0	0.0	0	0.0
07/27	109	369	3	50	5.4	19.5	0	0.0	0	0.0	1	6.2	0	0.0
07/27	109	370	2	50	5.4	20.0	0	0.0	0	0.0	3	18.0	2	12.0
07/27	109	371	1	50	5.4	20.0	0	0.0	0	0.0	0	0.0	3	18.0
07/27	110	372	3	50	5.4	18.5	0	0.0	0	0.0	0	0.0	0	0.0
07/27	110	373	2	50	5.4	19.5	0	0.0	0	0.0	4	24.6	1	6.2
07/27	110	374	1	50	5.4	19.0	0	0.0	0	0.0	1	6.3	1	6.3

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
07/28	111	375	3	50	5.4	22.0	0	0.0	1	5.5	6	32.7	9	49.1
07/28	111	376	2	50	5.4	20.0	0	0.0	0	0.0	2	12.0	1	6.0
07/28	111	377	1	50	5.4	20.0	0	0.0	0	0.0	1	6.0	10	60.0
07/28	112	NOT FISHED												
07/28	112													
07/29	113	378	3	50	5.4	19.5	0	0.0	0	0.0	2	12.3	3	18.5
07/29	113	379	2	50	5.4	19.5	1	6.2	0	0.0	4	24.6	0	0.0
07/29	113	380	1	50	5.4	19.5	1	6.2	0	0.0	3	18.5	2	12.3
07/29	114	381	3	50	5.4	20.5	0	0.0	0	0.0	7	41.0	0	0.0
07/29	114	382	2	50	5.4	20.5	0	0.0	0	0.0	2	11.7	1	5.9
07/29	114	383	1	50	5.4	21.0	0	0.0	0	0.0	0	0.0	3	17.1
07/30	115	NOT FISHED (MECHANICAL PROBLEMS WITH OUTBOARD MOTOR)												
07/30	115													
07/31	116	384	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/31	116	385	2	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
07/31	116	386	1	50	5.4	19.5	0	0.0	1	6.2	0	0.0	0	0.0
07/31	117	387	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	2	12.6
07/31	117	388	2	50	5.4	20.5	0	0.0	0	0.0	1	5.9	2	11.7
07/31	117	389	1	50	5.4	20.5	0	0.0	0	0.0	0	0.0	1	5.9
08/01	118	390	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
08/01	118	391	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	3	18.0
08/01	118	392	1	50	5.4	19.5	0	0.0	0	0.0	1	6.2	4	24.6
08/01	119	NOT FISHED (COMMERCIAL FISHING PERIOD)												
08/01	119													
08/02	120	393	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
08/02	120	394	2	50	5.4	21.5	0	0.0	0	0.0	2	11.2	5	27.9
08/02	120	395	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	1	6.3
08/02	121	396	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	1	6.3
08/02	121	397	2	50	5.4	19.0	0	0.0	0	0.0	1	6.3	2	12.6
08/02	121	398	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	2	12.3
08/03	122	399	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	1	6.2
08/03	122	400	2	50	5.4	22.5	0	0.0	0	0.0	2	10.7	7	37.3
08/03	122	401	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
08/03	123	402	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	2	12.0
08/03	123	403	2	50	5.4	19.5	0	0.0	0	0.0	1	6.2	0	0.0
08/03	123	404	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	1	6.2
08/04	124	405	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
08/04	124	406	2	50	5.4	22.5	0	0.0	0	0.0	0	0.0	13	69.3
08/04	124	407	1	50	5.4	21.5	0	0.0	0	0.0	0	0.0	2	11.2
08/04	125	408	3	50	5.4	21.0	0	0.0	0	0.0	0	0.0	7	40.0
08/04	125	409	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	3	18.0
08/04	125	410	1	50	5.4	21.0	0	0.0	0	0.0	1	5.7	4	22.9
08/05	126	NOT FISHED (ILLNESS)												
08/05	126													
08/05	127	411	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	4	25.3
08/05	127	412	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	9	54.0
08/05	127	413	1	50	5.4	20.0	0	0.0	0	0.0	0	0.0	4	24.0
08/06	128	414	3	50	5.4	21.0	0	0.0	0	0.0	1	5.7	15	85.7
08/06	128	415	2	50	5.4	23.0	1	5.2	1	5.2	10	52.2	18	93.9
08/06	128	416	1	50	5.4	18.0	0	0.0	0	0.0	0	0.0	2	13.3
08/06	129	NOT FISHED (COMMERCIAL FISHING PERIOD)												
08/06	129													
08/07	130	417	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	2	12.3

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
08/07	130	418	2	50	5.4	20.0	0	0.0	0	0.0	2	12.0	5	30.0
08/07	130	419	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
08/07	131	420	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	5	30.8
08/07	131	421	2	50	5.4	20.5	0	0.0	0	0.0	1	5.9	11	64.4
08/07	131	422	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	2	12.6
08/08	132	423	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	2	12.6
08/08	132	424	2	50	5.4	21.0	0	0.0	0	0.0	0	0.0	15	85.7
08/08	132	425	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	3	18.9
08/08	133	426	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	6	36.9
08/08	133	427	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	9	55.4
08/08	133	428	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	3	18.5
08/09	134	429	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	10	58.5
08/09	134	430	2	50	5.4	23.5	0	0.0	0	0.0	0	0.0	38	194.0
08/09	134	431	1	50	5.4	20.5	0	0.0	0	0.0	1	5.9	6	35.1
08/09	135	432	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
08/09	135	433	2	50	5.4	19.0	0	0.0	0	0.0	0	0.0	2	12.6
08/09	135	434	1	50	5.4	20.5	0	0.0	0	0.0	1	5.9	9	52.7
08/10	136	435	3	50	5.4	21.5	0	0.0	0	0.0	1	5.6	16	89.3
08/10	136	436	2	50	5.4	20.0	1	6.0	0	0.0	0	0.0	3	18.0
08/10	136	437	1	50	5.4	22.0	0	0.0	0	0.0	0	0.0	7	38.2
08/10	137	438	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	2	12.3
08/10	137	439	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	1	6.0
08/10	137	440	1	50	5.4	21.0	0	0.0	0	0.0	0	0.0	2	11.4
08/11	138	441	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	2	12.3
08/11	138	442	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	2	12.3
08/11	138	443	1	50	5.4	20.0	0	0.0	0	0.0	1	6.0	6	36.0
08/11	139	444	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	7	44.2
08/11	139	445	2	50	5.4	21.0	0	0.0	0	0.0	0	0.0	12	68.6
08/11	139	446	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	3	18.9
08/12	140	447	3	50	5.4	21.0	0	0.0	0	0.0	0	0.0	20	114.3
08/12	140	448	2	50	5.4	20.5	0	0.0	0	0.0	0	0.0	17	99.5
08/12	140	449	1	50	5.4	21.5	0	0.0	0	0.0	0	0.0	22	122.8
08/12	141	450	3	50	5.4	22.5	0	0.0	0	0.0	1	5.3	32	170.7
08/12	141	451	2	50	5.4	19.5	0	0.0	0	0.0	1	6.2	4	24.6
08/12	141	452	1	50	5.4	21.0	0	0.0	0	0.0	0	0.0	17	97.1
08/13	142	453	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	7	43.1
08/13	142	454	2	50	5.4	22.0	0	0.0	0	0.0	0	0.0	15	81.8
08/13	142	455	1	50	5.4	22.5	0	0.0	0	0.0	0	0.0	21	112.0
08/13	143	456	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	6	35.1
08/13	143	457	2	50	5.4	22.5	0	0.0	0	0.0	0	0.0	22	117.3
08/13	143	458	1	50	5.4	22.5	0	0.0	0	0.0	0	0.0	28	149.3
08/14	144	459	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	6	36.9
08/14	144	DRIFTS MISSED (MECHANICAL PROBLEMS WITH OUTBOARD MOTOR)												
08/15	145	460	3	50	5.4	23.0	0	0.0	0	0.0	0	0.0	27	140.9
08/15	145	461	2	50	5.4	24.0	1	5.0	0	0.0	0	0.0	87	435.0
08/15	145	462	1	50	5.4	14.0	0	0.0	0	0.0	0	0.0	14	120.0
08/15	146	463	3	50	5.4	19.0	0	0.0	0	0.0	1	6.3	4	25.3
08/15	146	464	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	3	18.5
08/15	146	465	1	50	5.4	20.0	0	0.0	0	0.0	0	0.0	6	36.0
08/16	147	466	3	50	5.4	21.5	0	0.0	0	0.0	1	5.6	11	61.4
08/16	147	467	2	50	5.4	20.5	0	0.0	0	0.0	0	0.0	9	52.7
08/16	147	468	1	50	5.4	21.5	0	0.0	0	0.0	0	0.0	13	72.6
08/16	148	NO FISHING (COMMERCIAL FISHING PERIOD)												
08/16	148													
08/16	148													
08/17	149	NO FISHING (POOR WEATHER)												
08/17	149													

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
08/17	149													
08/17	150	NO FISHING (POOR WEATHER)												
08/17	150													
08/17	150													
08/18	151	469	3	50	5.4	18.5	0	0.0	0	0.0	0	0.0	1	6.5
08/18	151	470	2	50	5.4	22.0	0	0.0	0	0.0	0	0.0	13	70.9
08/18	151	471	1	50	5.4	20.5	0	0.0	0	0.0	0	0.0	10	58.5
08/18	152	472	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	10	60.0
08/18	152	473	2	50	5.4	19.0	0	0.0	0	0.0	0	0.0	2	12.6
08/18	152	474	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	8	49.2
08/19	153	475	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	5	30.0
08/19	153	476	2	50	5.4	20.5	0	0.0	0	0.0	0	0.0	8	46.8
08/19	153	477	1	50	5.4	22.0	0	0.0	0	0.0	0	0.0	15	81.8
08/19	154	478	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	2	12.6
08/19	154	479	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	1	6.0
08/19	154	480	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	1	6.2
08/20	155	481	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	5	30.0
08/20	155	482	2	50	5.4	20.5	0	0.0	0	0.0	0	0.0	10	58.5
08/20	155	483	1	50	5.4	22.0	0	0.0	0	0.0	0	0.0	14	76.4
08/20	156	NO FISHING (COMMERCIAL FISHING PERIOD)												
08/20	156													
08/20	156													
08/21	157	484	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	1	6.3
08/21	157	485	2	50	5.4	19.0	0	0.0	0	0.0	0	0.0	2	12.6
08/21	157	486	1	50	5.4	20.0	0	0.0	0	0.0	0	0.0	11	66.0
08/21	158	487	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	3	18.9
08/21	158	488	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	1	6.0
08/21	158	489	1	50	5.4	19.0	0	0.0	0	0.0	0	0.0	1	6.3
08/22	159	490	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	3	18.0
08/22	159	491	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	3	18.5
08/22	159	492	1	50	5.4	21.0	0	0.0	0	0.0	1	5.7	12	68.6
08/22	160	493	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	2	12.3
08/22	160	494	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	4	24.0
08/22	160	495	1	50	5.4	20.5	0	0.0	0	0.0	0	0.0	11	64.4
08/23	161	496	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	13	76.1
08/23	161	497	2	50	5.4	21.0	0	0.0	0	0.0	0	0.0	15	85.7
08/23	161	498	1	50	5.4	21.5	0	0.0	0	0.0	0	0.0	27	150.7
08/23	162	499	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	5	30.8
08/23	162	500	2	50	5.4	19.0	0	0.0	0	0.0	0	0.0	2	12.6
08/23	162	501	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	6	36.9
08/24	163	502	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	1	6.3
08/24	163	503	2	50	5.4	19.0	0	0.0	0	0.0	0	0.0	1	6.3
08/24	163	504	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	6	36.9
08/24	164	505	3	50	5.4	18.0	0	0.0	0	0.0	0	0.0	3	20.0
08/24	164	506	2	50	5.4	18.5	0	0.0	0	0.0	0	0.0	3	19.5
08/24	164	507	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	5	30.8
08/25	165	508	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	1	6.2
08/25	165	509	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	2	12.3
08/25	165	510	1	50	5.4	22.5	0	0.0	0	0.0	0	0.0	6	32.0
08/25	166	511	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	7	41.0
08/25	166	512	2	50	5.4	20.5	0	0.0	0	0.0	0	0.0	4	23.4
08/25	166	513	1	50	5.4	23.0	0	0.0	0	0.0	0	0.0	13	67.8
08/26	167	514	3	50	5.4	21.0	0	0.0	0	0.0	0	0.0	8	45.7
08/26	167	515	2	50	5.4	21.0	0	0.0	0	0.0	0	0.0	6	34.3
08/26	167	516	1	50	5.4	20.5	0	0.0	0	0.0	0	0.0	5	29.3
08/26	168	517	3	50	5.4	20.5	1	5.9	0	0.0	0	0.0	1	5.9
08/26	168	518	2	50	5.4	21.0	0	0.0	0	0.0	0	0.0	3	17.1
08/26	168	519	1	50	5.4	20.0	0	0.0	0	0.0	0	0.0	6	36.0

----- continued -----

Appendix B. Catch^a and drift CPUE for the 1990 Bethel test fishery (con't).

Date	Tide No.	Drift No.	Stat. No.	Fath. Net Used	Mesh Size (in)	Mean Fishing Time (min.)	Chinook		Sockeye		Chum		Coho	
							Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
08/27	169	520	3	50	5.4	21.5	0	0.0	0	0.0	0	0.0	6	33.5
08/27	169	521	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	1	6.2
08/27	169	522	1	50	5.4	22.5	0	0.0	0	0.0	1	5.3	9	48.0
08/27	170	523	3	50	5.4	19.0	0	0.0	0	0.0	0	0.0	0	0.0
08/27	170	524	2	50	5.4	21.0	0	0.0	0	0.0	0	0.0	2	11.4
08/27	170	525	1	50	5.4	21.0	0	0.0	0	0.0	0	0.0	3	17.1
08/28	171	526	3	50	5.4	22.5	0	0.0	0	0.0	0	0.0	1	5.3
08/28	171	527	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
08/28	171	528	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
08/29	172	529	3	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
08/29	172	530	2	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
08/29	172	531	1	50	5.4	14.0	0	0.0	0	0.0	0	0.0	1	8.6
08/29	173	532	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	1	6.0
08/29	173	533	2	50	5.4	20.5	0	0.0	0	0.0	0	0.0	3	17.6
08/29	173	534	1	50	5.4	22.0	0	0.0	0	0.0	0	0.0	1	5.5
08/30	174	535	3	50	5.4	20.0	0	0.0	0	0.0	0	0.0	0	0.0
08/30	174	536	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
08/30	174	537	1	50	5.4	20.5	0	0.0	0	0.0	0	0.0	4	23.4
08/30	175	538	3	50	5.4	20.5	0	0.0	0	0.0	0	0.0	0	0.0
08/30	175	539	2	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
08/30	175	540	1	50	5.4	19.5	0	0.0	0	0.0	0	0.0	0	0.0
08/31	176	541	3	50	5.4	22.5	0	0.0	0	0.0	0	0.0	0	0.0
08/31	176	542	2	50	5.4	28.5	0	0.0	0	0.0	0	0.0	0	0.0
08/31	176	NO FISHING (TOO MUCH TRASH IN THE RIVER)												
Total							283	1633.3	433	2344.6	1180	6295.9	1099	6256.1

^a Appendix B includes fish caught in 13.6 cm (5-3/8 in.) and 20.3 cm (8 in.) mesh gill nets; therefore, values may vary from those reported in Table 2.

Appendix C. Historic mean date of salmon migration at the Bethel test fish site, 1984-1990.^a

Species	Year	Mean Date	Variance
Chinook	1984	22 June	99.9
	1985	28 June	290.6
	1986	22 June	335.2
	1987	24 June	464.6
	1988	22 June	543.4
	1989	<u>24 June</u>	<u>389.0</u>
	Mean (84-89):	24 June	353.8
	1990	26 June	148.7
Sockeye	1984	N.A.	N.A.
	1985	30 June	106.8
	1986	27 June	221.4
	1987	25 June	244.6
	1988	24 June	206.1
	1989	<u>24 June</u>	<u>193.2</u>
	Mean (84-89):	26 June	194.4
	1990	28 June	59.3
Chum	1984	1 July	49.6
	1985	4 July	476.7
	1986	2 July	362.7
	1987	6 July	397.3
	1988	31 June	435.9
	1989	<u>31 June</u>	<u>349.1</u>
	Mean (84-89):	3 July	345.2
	1990	7 July	118.5
Coho	1984	9 August	76.7
	1985	10 August	52.4
	1986	10 August	248.9
	1987	16 August	333.0
	1988	11 August	227.6
	1989	<u>6 August</u>	<u>173.9</u>
	Mean (84-89):	10 August	185.4
	1990	13 August	59.0

^aCalculations using the adjusted and unadjusted CPUE have the same result.

Appendix D. Historic test fish catch data and adjustment calculations for salmon caught in the Bethel test fishery.^a

Species	Year	Cum. Catch	Cum. CPUE	Adjustment Factor	Adjusted Cum. CPUE
Chinook	1984	231	273.1	3.8549	1,052.8
	1985	79	114.1	5.7359	654.5
	1986	127	201.1	3.5694	717.7
	1987	384	582.0	4.0423	2,352.5
	1988	238	361.0	5.7648	2,080.9
	1989	314	523.4	b	b
	Mean (84-89):		342.5	4.5935	1,371.7
	1990	283	446.9	2.2773	1,013.0
Sockeye	1984	267	579.4	b	b
	1985	694	1,654.3	2.1318	3,526.6
	1986	869	2,445.3	1.7028	4,163.9
	1987	943	2,761.0	1.6568	4,576.0
	1988	583	1,500.5	1.9524	2,929.7
	1989	256	799.0	b	b
	Mean (84-89):		1,623.3	1.8610	3,799.0
	1990	406	1,114.4	0.9874	1,100.2
Chum	1984	1,186	2,386.5	5.1798	12,361.6
	1985	616	1,327.4	3.9702	5,269.9
	1986	1,688	4,065.9	1.9438	7,903.3
	1987	2,302	4,899.9	2.8911	14,159.5
	1988	2,107	5,188.9	6.2654	32,510.6
	1989	937	2,609.5	5.0003	13,050.3
	Mean (84-89):		3,413.0	4.0925	13,932.5
	1990	1,105	2,721.9	5.3907	14,658.8
Coho	1984	2,152	3,057.2	2.9442	9,001.0
	1985	1,091	1,575.4	3.8487	6,063.1
	1986	2,714	4,099.2	2.2266	9,127.2
	1987	1,227	1,990.5	4.1352	8,231.2
	1988	1,989	3,159.8	2.5515	8,062.1
	1989	1,703	2,451.3	b	b
	Mean (84-89):		2,722.2	3.0829	7,918.7
	1990	1,093	2,485.1	2.3260	5,780.3

^a Adjustment factors were calculated based on relationships between declines in the test fishing CPUE's and associated downstream catches.

Appendix E. Log of catchability adjustment analysis for each commercial fishing period in 1990.

Species	Comm. Fishing Period	Adjustment Factor	Used in Mean Adjustment?	Comments
Chinook	1	2.2773	no	Poor affected tide depression.
	2		no	Poor affected tide depression.
	3		yes	Reasonable affected and recovery zones.
	4		no	Poor building pattern, low numbers, poor affected zone, poor recovery zone.
Sockeye	1	0.9874	yes	Reasonable building pattern, good affected zone, strong but erratic recovery zone. Estimate for tide 38 was not included.
	2	0.6072	no	Erratic building pattern, poor affected zone and erratic recovery.
	3		yes	Marginal; good building pattern, first affected tide is high but following 4 tides are reasonably low.
	4		no	Strong building pattern but distinct alternating pattern in tides; good affected zone but erratic recovery.
	5		no	Erratic building pattern with alternating pattern in tides; fair affected zone but no recovery
Chum	1	13.6575	no	Small sample size.
	2	4.4598	no	Poor affected zone.
	3a	9.7392	no	Fair affected zone, poorly defined recovery zone.
	3b	6.2651	yes	Same as 3a but only use 1 tide to estimate recovery period.
	4a	1.8562	no	Good building pattern, good affected zone, erratic recovery zone.
	4b	1.3866	yes	Same as 4a but only use one tide to estimate recovery period.
	5	20	no	Poor affected zone.
	6	8.5203	yes	Fair building pattern, good affected and recovery zones.
Coho	7	3.6811	no	Small sample size, no building pattern; poor affected and recovery zones.
	8		yes	Good building pattern, fair affected zone of 5 tides, recovery zone is marginal.
	9		yes	Fair building pattern, good affected and recovery zones.
	10	12.2450	no	Poor affected zone, many estimated CPUE's.
	11		no	Many estimated CPUE's.
	12		no	Similar to 9 but less distinct recovery.

Appendix F. Historic commercial salmon catch from statistical areas in the lower Kuskokwim River.^a

Year	Statistical Area 335-11				Statistical Area 335-12				Statistical Area 335-13				Statistical Area 335-14			
	Chinook	Sockeye	Coho	Chum	Chinook	Sockeye	Coho	Chum	Chinook	Sockeye	Coho	Chum	Chinook	Sockeye	Coho	Chum
1984	20,229	45,276	332,679	385,178					9,717	1,295	272,419	10,853				
1985	18,146	53,395	168,192	116,832					17,885	50,655	161,233	73,843				
1986	9,329	46,505	301,093	169,958					9,181	46,670	342,096	134,243				
1987	32,182	82,130	226,229	329,748					13,415	52,046	159,053	232,995				
1988	40,355	60,168	290,872	861,433					12,540	27,127	199,036	453,012	915	2,469	18,509	47,537
1989	29,702	28,319	233,182	498,490					10,856	11,499	192,796	203,120	1,187	1,570	35,056	25,782
1990	6,195	8,992	64,169	54,434	29,195	38,113	196,827	224,148	12,017	20,959	94,842	103,220	4,731	14,349	40,678	57,737

^a From 1984 to 1989 statistical area 335-11 extended from Bethel to the mouth of the Kuskokwim River; statistical areas up stream were numbered 335-12 and 335-13, respectively. In 1990 statistical area 335-11 was split into two statistical areas, 335-11 and 335-12; areas up stream of Bethel were renumbered as 335-13 and 335-14 to account for this change. This table presents data from all years using the 1990 numbering system.

Appendix G. The 1990 commercial salmon catch, in numbers of fish, for District 1 statistical areas.

Fishing Date Period	Statistical Area 335-11				Statistical Area 335-12				Statistical Area 335-13				Statistical Area 335-14				Chum
	Chinook	Sockeye	Coho	Chum	Chinook	Sockeye	Coho	Chum	Chinook	Sockeye	Coho	Chum	Chinook	Sockeye	Coho	Chum	
1 6/20	2,580	2,021	0	5,353	14,110	8,297	0	24,953									
2 6/25	1,453	2,719	0	6,986	7,342	13,289	0	32,077	5152	7,408	0	10,387	2,084	3,608	0	9,494	
3 6/29	694	975	0	5,116	3,815	7,660	0	35,828	3,477	6,016	0	20,099	1,442	4,123	0	13,868	
4 7/05	518	1,509	0	11,354	1,589	3,954	0	40,720	1,305	2,580	0	23,669	659	2,716	0	11,092	
5 7/09	455	721	0	12,405	1,201	3,172	0	43,347	903	2,845	0	24,575	245	2,019	0	11,084	
6 7/14	254	868	43	11,053	864	1,471	15	40,580	769	1,547	12	19,037	240	1,581	0	9,133	
7 8/01	36	50	3,662	1,167	129	130	14,536	3,663	53	77	3,736	1,984	34	276	1,624	2,252	
8 8/06	170	37	20,675	601	71	68	28,431	1,979	52	10	8,923	1,293	13	21	3,508	726	
9 8/10	22	28	11,208	244	40	32	17,860	612	26	5	18,171	348	6	2	11,131	65	
10 8/13	6	27	16,138	67	16	15	83,038	260	14	5	12,956	173	2	1	3,356	9	
11 8/16	6	14	7,328	60	8	12	21,734	77	9	2	27,544	96	5	1	12,084	6	
12 8/20	0	15	3,259	27	8	11	25,003	44	2	7	17,669	37	1	1	5,907	5	
13 8/27	1	8	1,856	1	2	2	6,210	8	255	457	5,831	1,522	0	0	3,068	3	
TOTAL	6,195	8,992	64,169	54,434	29,195	38,113	196,827	224,148	12,017	20,959	94,842	103,220	4,731	14,349	40,678	57,737	

Appendix H. Daily water temperature and clarity of the Kuskokwim River at the Bethel test fishing site, 1984 - 1990.

Date	Water Temperature (C)							Secchi Reading (m)						
	1984	1985	1986	1987	1988	1989	1990	1984	1985	1986	1987	1988	1989	1990
05/31	11							-						
06/01	10					-	12	-					0.20	0.70
06/02	11				9	-	12	-				0.20	0.50	0.30
06/03	11	7			9	-	12	-	0.10			0.30	0.30	-
06/04	13	7		14	10	9	13	-	0.10		0.70	0.20	0.25	0.50
06/05	13	7	7	16	10	9	12	-	0.10	0.45	0.70	0.30	0.40	0.50
06/06	13	8	-	16	10	9	13	-	0.20	0.35	0.60	0.30	0.30	0.60
06/07	12	8	7	16	11	9	12	-	0.20	0.50	0.70	0.35	0.30	0.30
06/08	12	8	7	15	10	9	-	-	0.20	0.30	0.70	0.30	0.35	0.30
06/09	13	9	8	16	10	9	-	1.00	0.20	0.45	0.70	0.40	0.30	0.30
06/10	13	9	8	14	11	9	-	0.70	0.20	0.35	0.60	0.40	0.40	0.50
06/11	15	10	8	14	11	10	-	0.70	0.30	0.35	0.70	0.40	0.40	0.30
06/12	-	-	11	14	11	9	-	1.00	-	0.45	0.70	0.35	0.40	0.20
06/13	16	8	12	12	12	11	-	-	0.30	0.45	0.70	0.40	0.60	0.15
06/14	16	8	12	10	12	11	-	1.10	0.30	0.45	0.70	0.35	0.35	0.30
06/15	15	9	12	10	12	12	-	1.00	0.30	0.60	0.60	0.35	0.40	0.30
06/16	16	11	14	10	13	12	12	0.90	0.40	0.75	0.60	0.40	0.30	0.30
06/17	16	10	14	11	13	12	12	0.80	0.40	0.60	0.60	0.35	0.50	-
06/18	16	10	14	12	13	12	12	0.60	0.40	0.65	0.60	0.40	0.60	0.15
06/19	16	11	13	12	13	12	12	0.60	0.30	0.65	0.60	0.40	0.60	0.15
06/20	16	-	13	11	11	12	12	0.60	-	0.65	0.70	0.35	0.40	0.15
06/21	16	10	13	12	11	-	11	0.60	0.30	0.55	-	0.30	-	0.15
06/22	16	10	13	14	-	13	11	0.60	0.40	0.55	-	-	0.55	0.20
06/23	16	11	-	12	11	13	10	0.60	0.40	-	-	0.35	1.00	0.20
06/24	15	-	13	12	12	13	11	0.50	0.40	0.60	0.65	0.30	0.75	0.20
06/25	15	11	13	12	11	12	12	0.40	0.40	0.60	0.75	-	-	0.20
06/26	15	12	13	13	12	13	12	0.40	0.50	0.50	0.70	0.25	0.20	0.25
06/27	16	12	13	13	11	13	11	0.40	-	0.55	0.70	0.30	0.50	0.20
06/28	16	-	13	13	11	13	11	0.40	-	0.30	0.70	0.25	0.60	0.25
06/29	16	10	-	13	12	14	12	0.40	0.40	0.50	0.80	0.30	0.60	0.30
06/30	16	-	16	13	13	-	14	0.40	-	0.40	0.50	0.35	-	-
07/01	16	13	16	12	14	16	15	0.40	-	0.40	0.70	0.30	0.50	0.55
07/02	17	12	17	12	15	14	16	0.50	0.50	0.50	0.40	0.40	0.60	0.60
07/03	17	12	13	-	15	-	16	0.30	0.50	0.55	-	0.40	-	0.50
07/04	16	-	-	14	-	17	16	0.30	-	-	0.40	-	0.40	0.70
07/05	16	13	17	13	15	18	17	0.30	0.50	0.70	0.40	0.30	0.30	0.60
07/06	16	14	17	13	15	18	17	0.30	0.50	0.65	0.40	0.30	0.25	0.60
07/07	15	14	16	14	16	17	16	0.30	0.40	0.55	0.50	0.40	0.50	0.40
07/08	14	13	17	14	-	17	16	0.30	0.30	0.90	0.70	-	0.40	0.40
07/09	13	13	16	-	14	15	16	0.20	-	0.90	0.50	0.25	0.35	0.40
07/10	13	13	16	13	15	15	-	0.20	-	0.60	0.50	0.30	0.20	0.20
07/11	15	13	15	13	-	15	-	0.20	0.20	0.60	0.50	-	-	0.25
07/12	15	15	16	13	14	15	16	0.30	0.20	-	0.60	0.20	0.20	0.20
07/13	16	13	-	13	14	15	16	0.30	0.20	-	0.60	0.20	0.20	0.20
07/14	16	15	14	13	15	-	15	0.30	0.20	0.30	0.50	0.15	-	0.15
07/15	16	15	15	14	16	15	16	0.30	0.20	0.20	0.50	0.15	0.20	0.15
07/16	17	15	15	12	17	15	16	0.20	0.20	0.20	0.45	0.15	0.20	0.15
07/17	17	15	15	12	14	14	16	0.20	0.20	0.25	0.35	0.25	0.25	0.15
07/18	16	15	15	14	15	13	17	0.20	0.20	0.25	-	0.25	0.30	0.15
07/19	15	16	-	12	17	13	16	0.20	0.30	-	0.35	0.25	0.30	0.15
07/20	15	16	-	-	16	12	17	0.20	0.30	-	-	0.25	0.20	0.20
07/21	15	-	13	12	17	12	17	0.20	-	0.20	0.30	0.20	0.30	0.20
07/22	15	17	13	11	18	12	17	0.30	0.30	0.25	0.30	0.20	0.30	0.35
07/23	17	17	13	11	18	12	17	0.40	0.30	0.30	0.40	0.20	0.30	0.30
07/24	15	17	13	11	18	12	17	0.40	0.30	0.25	0.35	0.20	0.20	0.35
07/25	16	17	12	-	-	13	18	0.40	0.30	0.20	-	-	0.20	0.30
07/26	16	17	12	-	17	13	17	0.40	0.30	0.20	-	0.20	0.20	0.35
07/27	16	17	12	12	16	-	16	0.40	0.30	0.20	0.30	0.15	-	0.40
07/28	16	-	13	13	15	12	17	0.40	0.30	0.15	0.20	0.10	0.20	0.35

---- continue ----

Appendix H. Daily water temperature and clarity of the Kuskokwim River at the Bethel test fishing site, 1984 - 1990 (con't).

Date	Water Temperature (C)							Secchi Reading (m)						
	1984	1985	1986	1987	1988	1989	1990	1984	1985	1986	1987	1988	1989	1990
07/29	16	17	13	14	15	14	-	0.30	0.30	0.10	0.25	0.15	0.20	0.35
07/30	15	17	13	14	15	14	-	0.30	0.30	0.05	0.20	0.10	0.30	-
07/31	15	17	13	-	15	-	16	0.30	0.30	-	0.20	0.15	-	0.40
08/01	15	19	12	12	15	14	16	0.20	0.30	0.25	0.30	0.15	0.20	0.35
08/02	16	18	12	-	15	14	15	0.20	0.30	0.05	0.20	0.10	0.30	0.20
08/03	16	18	12	-	14	14	14	0.20	0.30	0.05	0.20	0.10	0.30	0.20
08/04	15	18	12	-	15	14	14	0.20	0.30	0.10	0.30	0.15	0.30	0.20
08/05	15	18	11	-	16	13	16	0.20	0.30	0.15	0.30	0.15	0.20	0.20
08/06	-	16	12	-	16	13	16	-	-	0.20	0.30	0.20	0.30	0.15
08/07	-	16	12	-	15	14	16	-	0.30	0.20	0.30	0.20	-	0.20
08/08	16	-	13	-	-	14	16	0.20	-	0.25	0.30	-	0.30	0.20
08/09	16	14	13	-	13	14	16	0.20	-	0.20	0.20	0.25	0.30	0.20
08/10	15	13	11	-	-	14	16	0.10	0.30	0.25	0.15	-	0.30	0.25
08/11	15	-	12	14	12	14	16	0.20	-	0.25	0.15	0.25	0.30	0.30
08/12	-	13	12	14	12	-	16	-	-	0.20	0.20	0.20	-	0.40
08/13	15	12	-	-	12	13	16	0.10	0.20	0.25	-	0.20	0.20	0.40
08/14	15	12	-	12	11	13	-	0.10	-	-	0.15	0.30	0.20	-
08/15	15	12	11	12	11	13	16	0.10	-	-	0.20	0.20	0.20	0.50
08/16	14	11	12	12	11	14	14	0.10	0.20	0.30	-	0.25	0.20	0.40
08/17	14	11	12	12	11	14	-	0.10	0.20	0.40	-	0.25	0.20	-
08/18	14	-	13	12	11	13	14	0.10	0.10	0.30	-	0.20	0.20	0.20
08/19	16	-	11	16	12	13	13	0.10	0.10	0.30	0.20	0.20	0.20	0.20
08/20	-	-	13	13	12	13	13	-	0.10	0.35	0.30	0.25	0.15	0.15
08/21	14	11	13	16	12	13	13	0.10	0.10	0.35	0.30	0.25	0.15	0.20
08/22	13	11	13	13	12	13	13	0.10	-	0.30	0.45	0.20	0.20	0.30
08/23	11	10	12	14	11	12	13	0.20	0.20	0.45	0.35	0.25	0.20	0.20
08/24	12	10	12	-	11	13	12	0.20	0.20	0.40	0.35	0.20	0.25	0.15
08/25	11	10	-	-	11	-	-	0.20	0.20	-	0.35	0.30	-	-
08/26	9	10	-	-	9	-	12	0.20	0.30	-	0.40	0.40	-	0.10
08/27	10	11	12	-	9	-	12	0.20	0.30	0.30	0.35	0.35	-	0.15
08/28	9	11	-	-	10	12	12	0.20	0.30	-	0.40	0.45	0.30	0.10
08/29	9	11	-	16	11	12	12	0.10	0.30	-	0.45	0.40	-	0.25
08/30	9	-	-	15	-	12	12	0.10	-	-	0.35	-	0.35	0.15
08/31	9	-	-	-	-	12	11	0.10	-	-	-	-	0.30	-
09/01	9	-	-	14	-	-	-	0.10	-	-	0.35	-	-	-
09/02	9	-	-	14	-	-	-	0.10	-	-	0.40	-	-	-
09/03	-	-	-	13	-	-	-	-	-	-	0.50	-	-	-
09/04	9	-	-	13	-	-	-	0.20	-	-	0.45	-	-	-
09/05	9	-	-	13	-	-	-	0.10	-	-	0.40	-	-	-
09/06	9	-	-	12	-	-	-	0.10	-	-	0.50	-	-	-
09/07	-	-	-	11	-	-	-	-	-	-	0.45	-	-	-
09/08	-	-	-	10	-	-	-	-	-	-	0.50	-	-	-
09/09	-	-	-	9	-	-	-	-	-	-	0.55	-	-	-
09/10	-	-	-	8	-	-	-	-	-	-	0.45	-	-	-
09/11	-	-	-	8	-	-	-	-	-	-	0.45	-	-	-
09/12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean	14	13	13	13	13	13	14	0.33	0.28	0.38	0.45	0.26	0.33	0.29
Minimum	9	7	7	8	9	9	10	0.10	0.10	0.05	0.15	0.10	0.15	0.10
Maximum	17	19	17	16	18	18	18	1.10	0.50	0.90	0.80	0.45	1.00	0.70